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The Atlantic mackerel (*Scomber scombrus* L.) in NAFO Subareas 3 and 4 in 2011

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

In 2011, preliminary landings of Atlantic mackerel (*Scomber scombrus* L.) in the Northwest Atlantic totalled 9,845 t, which represents major decreases of 39,577 t and 55,768 t from 2010 and 2009. In eastern Canada, 8,544 t were landed with 7,320 t (86%) in Newfoundland. These landings are the lowest since 1963. Most of the landings off the west coast of Newfoundland were from unit areas 4Rb and 4Rc with respective totals of 3,378 t and 1,575 t. On the east coast of Newfoundland, the most important landings were from unit areas 3Kh and 3Ki with respective values of 271 t and 133 t. In addition to this decline of the commercial landings, mackerel have almost disappeared from the multidisciplinary groundfish surveys conducted annually on the Scotian Shelf. Moreover, the mean lengths of the by-catches of the summer survey are decreasing since the beginning of the 1990s. Mean lengths of the line and gillnet catches are decreasing for a few years and remain below historical averages. The condition index seems strongly related to the Cold Intermediate Layer (CIL) temperatures. The growth of the dominant year-classes is less important than that of other classes which seems to indicate the presence of an inverse relationship with density. Maturity at age has varied little over the years unlike the maturity at length with the highest proportions of maturity that were observed during the years 2000. Since the early 2000s, Canadian landings have been greatly dominated by fish from the 1999 year-class. Between 2000 and 2003, fish from this year-class have accounted for between 41% and 77% of all catches in numbers, which had not been observed since the late 1960s. Nevertheless, the relative significance of this year-class dropped sharply beginning in 2005 in favour of the 2003, 2005, 2007, and 2008 year-classes which disappear of the fishery after a few years only. Catches in the order of 50,000 t have been supported in the past by the strong 1999 year-class. It is uncertain that catches of that level can be realized in the years to come with the year-classes presently available to the fishery.

RÉSUMÉ

En 2011, les débarquements préliminaires de maquereau bleu (*Scomber scombrus* L.) pour le nord-ouest de l'Atlantique se sont chiffrés à 9 845 t, ce qui représente des baisses majeures de 39 577 t et 55 768 t par rapport à 2010 et 2009. Un total de 8 544 t ont été débarquées dans l'est du Canada dont 7 320 t (86 %) à Terre-Neuve. Ces débarquements sont les plus faibles depuis 1963. La plupart des débarquements de la côte ouest de Terre-Neuve ont été réalisés dans les zones unitaires 4Rb et 4Rc avec des tonnages respectifs de 3 378 t et 1 575 t. Sur la côte est de Terre-Neuve, les plus importants débarquements ont été réalisés dans les zones unitaires 3Kh et 3Ki avec des valeurs respectives de 271 t et 133 t. En plus de cette baisse des débarquements commerciaux, le maquereau est presque disparu des relevés multidisciplinaires de poissons de fond réalisés annuellement sur le plateau néo-écossais. De plus, les tailles moyennes des prises accessoires du relevé d'été sont à la baisse depuis le début des années 1990. Les tailles moyennes des captures à la ligne et au filet maillant sont à la baisse depuis quelques années et demeurent sous les moyennes historiques. L'indice de condition semble être fortement relié aux températures de la Couche Intermédiaire Froide (CIF). La croissance des classes d'âge dominantes est moins importante que celle des autres classes ce qui semble indiquer la présence d'une relation inverse avec la densité. La maturité à l'âge a peu varié au cours des ans contrairement à la maturité à la longueur dont les proportions les plus élevées de maturité ont été observées au cours des années 2000. Depuis le début des années 2000, les débarquements canadiens ont fortement été dominés par les poissons de la classe d'âge de 1999. Entre 2000 et 2003, les poissons de cette classe d'âge constituaient entre 41 % et 77 % de toutes les captures en nombre, du jamais vu depuis la fin des années 1960. Cependant, l'importance relative de cette classe d'âge a chuté rapidement à partir de 2005 en faveur des classes d'âge de 2003, 2005, 2007 et 2008 qui disparaissent de la pêche après quelques années seulement. Des captures de l'ordre de 50 000 t ont été supportées dans le passé par la classe d'âge de 1999. Il est incertain que des captures de cet ordre puissent être réalisées au cours des prochaines années avec les classes d'âges qui sont présentement disponibles à la pêche.

1. INTRODUCTION

This research document presents the Atlantic mackerel (*Scomber scombrus* L.) fishery, commercial sampling, and by-catches data of NAFO Subareas 3 and 4 (Canadian waters) (Figure 1) following the 2008-2011 fishing seasons. Data from the commercial and recreational fisheries in American waters are also presented but for information purpose only. The results presented in this document as those concerning the abundance assessment (Grégoire *et al.* 2012, 2013) were used in the writing of a Science Advisory Report (DFO 2012). The latter was used for the preparation of the management plan of the 2012 and 2013 fishing seasons.

2. MATERIAL AND METHODS

2.1 LANDINGS

Commercial fishery data for NAFO Subareas 3-4 were taken from the most recent Zonal Interchange File Format (ZIFF) files. In order to facilitate their interpretation, these data were grouped according to country, province, division, sub-division and NAFO unit area, as well as by month and type of fishing gear. The temporal patterns of the Newfoundland purse seine fishery and the maritime provinces and Quebec fixed gears fisheries were described in terms of daily cumulative landings and median landing dates.

Catches and by-catches data of Atlantic mackerel collected by Nova Scotia observers were grouped by location of the catches, gear, month, and main species sought. These observers are on board a certain number of Canadian vessels for the sampling of the catches.

The commercial and recreational fisheries data in American waters were provided by the National Fisheries Science Center of Woods Hole in Massachusetts and the Mid-Atlantic Fishery Management Council of Dover, Delaware. The evolution of the weekly catches in American waters can be tracked at the following address: http://www.nero.noaa.gov/ro/fso/reports/reports_frame.htm

2.1.1 Total allowable catch (TAC)

Between 1987 and 2000, the total allowable catch (TAC) for all the Northwest Atlantic was 200,000 t. Following the low biomass estimates from the 1996, 1998 and 2000 Canadian egg surveys, Canada lowered the TAC to 150,000 t for the 2001-2009 period. In 2005, the US proposed TACs of more than 200,000 t for the 2006-2008 period. The TAC was ultimately lowered to 80,000 t following the 2009-2010 joint Canada-US assessment, and to 60,000 t following the 2010 Canadian Advisory Committee. For information purpose, the details of the calculation of the US portion of the TAC are presented in the following document: http://www.nero.noaa.gov/nero/regs/frdoc/12/12SMB2012SpecsEA.pdf

2.2 BY-CATCHES FROM THE MULTIDISCIPLINARY GROUNDFISH SURVEYS

Mackerel is a by-catch of the multidisciplinary groundfish surveys conducted on the Scotian Shelf and Georges Bank. Mean numbers per tow (catch rates) of these surveys were calculated and presented as well as the mean annual numbers and the mean numbers by length class. Bottom temperatures were kriged with the 10.7.972 version of SURFER (Golden Software 2012) and added to the mean numbers distribution maps. All these data were taken from the Virtual Data Center, DFO, Bedford Institute of Oceanography, Nova Scotia.

2.3 COMMERCIAL SAMPLING

Length frequencies measured at dockside were grouped by fishing gear and weighted by the corresponding landings allowing to calculate the mean annual lengths by fishing gear.

Length frequencies were also grouped by quarter and converted into catches at age with age-length keys and some of the APL functions of CATCH (Anonymous 1986). Logarithmic values of the catch at age (three-year moving average) were compared between consecutive ages to describe the annual changes in mortality. An increase of these values is interpreted as an increase in fishing mortality (F). For the older age groups, these values correspond to the total mortality (Z). Biomasses of the catch at age, that are the product of the numbers and weights at age, were compared with landings in order to detect errors of grouping or weighting when calculating the catch at age. Mean lengths and somatic weights at age were calculated by year and by year-class according to the von Bertalanffy growth model (Ricker 1980).

Biological data analyzed in the laboratory were used to calculate the maturity ogives by year and for each year-class sampled since 1973. These ogives were used to determine the age and size at 50% maturity (A_{50} and L_{50}). The annual values of L_{50} were compared with the minimum legal catch size which is currently 250 mm.

Daily and monthly (June) averages of the Fulton condition factor (Ricker 1980) were calculated for the period 1973-2011. The monthly averages were compared with the index of temperature (°C) of the Cold Intermediate Layer (CIL) (Galbraith *et al.* 2012). Average condition factors were also calculated by age, year-class and length class.

2.4 JOHNSON'S INDEX

Year-classes strength of Atlantic mackerel has to be interpreted with caution as the catch at age is associated to a long period of time (1968-2011) characterized by different fishing practices, gears and exploitation levels. The Johnson's index (Johnson 1957) was therefore used to quantify the relative strength of the year-classes sampled in Canadian waters since 1973.

2.5 INSTANTANEOUS RATE OF TOTAL MORTALITY

The periodic presence of dominant year-classes is one of the main characteristics of the demographic structure of the Atlantic mackerel. The total mortality (Z) applied on these year-classes was measured according to Ricker's catch curves method (Ricker 1980). The total catches (t) associated to these year-classes were determined by the product of the corresponding numbers and weights at age.

3. RESULTS

3.1 LANDINGS

3.1.1 Historical overview

At the end of the 1960s, landings of Atlantic mackerel in the Northwest Atlantic (NAFO subareas 2 to 6) have known a significant increase following the arrival of a fleet of foreign vessels. Historical highs of over 250,000 t per year were reached between 1970 and 1976. Atlantic mackerel landings dropped considerably in 1977 following the establishment of the 200-nautical-mile exclusive economic zone (EEZ). However, as a result of agreements in the early 1980s between the United States and the USSR, they increased again to peak at 86,891 t in 1990 (Table 1; Figure 2). Thereafter, landings dropped considerably as the US gradually reduced the quotas allocated to the USSR and the complete closure of this fishery in 1992.

3.1.2 In the Northwest Atlantic

Between 2008 and 2010, Atlantic mackerel landings in the Northwest Atlantic ranged from 49,422 t to 65,613 t, which represents significant declines from the previous five years (Table 1). Preliminary landings of 2011 totalled 9,845 t, which is the lowest value since 1963.

3.1.3 In American waters

Commercial landings in American waters have known an important increase between 2000 and 2006. From 2006 to 2007, they went from 56,640 t to 25,547 t before reaching 9,891 t in 2010 (Table 1). Landings in 2011 were only 500 t, the lowest value since 1960. Preliminary landings from the winter fishery of 2012 are 5,000 t. Between 2007 and 2011, landings data from the US recreational fishery ranged from 691 t to 884 t (Table 1).

There has been no offshore fishery by foreign vessels in American waters since 1992. It's this fishery, based on agreements between the United States and the USSR, which was at the origin of the landings increase of the 1980s (Figure 2).

3.1.4 In Canadian waters

Between 2008 and 2010, Canadian (declared) landings ranged from 29,671 t to 42,231 t to reach only 8,544 t (preliminary value) in 2011 (Table 1). The final landings of 2011 will be higher by some thousands of tons (by taking account of the historical means) because the fishing data from the southern Gulf of St. Lawrence and Nova Scotia were not all recorded at the time of this assessment (April 2012).

3.1.5 By Canadian province

Between 2008 and 2010, landings in Newfoundland ranged from 23,036 t to 33,159 t, which represents from 78% to 86% of all Canadian landings (Table 2). In 2011, landings in Newfoundland were only 7,320 t, which nevertheless represents 86% of all Canadian landings (Figure 3A). For the 1995-2010 period, the mean annual landings for Newfoundland, Nova Scotia, and Prince Edward Island totalled 20,709 t, 4,169 t and 4,161 t respectively compared with 3,097 t and 1,664 t for Quebec and New Brunswick (Table 2). Landings realized in each province in 2011 were lower than the respective averages of the 1995-2010 period (Figure 3B). The proportion of Canadian landings attributed to Newfoundland has been on the rise between 1999 and 2010 (Figure 4A).

3.1.6 By fishing gear

Between 2008 and 2010, from 15,659 t to 20,688 t (49% to 53%) of mackerel were caught and landed using small purse seines and from 5,178 t to 9,015 t (17% to 21%) using large purse seines (Table 3). In 2011, small and large purse seines landings accounted respectively for 53% and 14% of all landings (Figure 5A). In descending order of importance, purse seines were followed by the Tuck-Ring seines, traps, handline, and gillnets. In 2011, only the Tuck-Ring seine landings were (slightly) higher than the average of the 1995-2010 period (Figure 5B). Between 1997 and 2007, the proportion of Canadian landings attributed to the seine (purse and Tuck-Ring) ranged from 5% to 81% and has subsequently remained at about 80% (Figure 4B).

3.1.7 By region, division and unit area

Between 2008 and 2010, landings in the Gulf of St. Lawrence (Divisions 4RST) ranged from 18,913 t to 28,792 t and from 552 t to 1,173 t for the Scotian Shelf (Divisions 4VWX5YZ (Table 4). For the same period, they ranged from 9,295 t to 19,288 t for the east and southern coasts of

Newfoundland (Divisions 3KLP). In 2011, landings were of 6,128 t in the Gulf of St. Lawrence compared to 381 t and 2,035 t for the Scotian Shelf and the east and southern coasts of Newfoundland.

The most important divisions were 4R, 4T, 3K, and 4X with average landings (1995-2010) of 11,752 t, 9,785 t, 6,691 t, and 2,599 t (Table 4). In 2011, landings for these divisions were 5,296 t, 725 t, 427 t, and 366 t, respectively.

Between 1995 and 2010, the most important landings of the east and south coasts of Newfoundland were realized in unit areas 3Kd and 3Kh of Division 3K, 3Lb and 3La of Division 3L, and subdivision 3Pn of Division 3P (Table 5). On the west coast of Newfoundland, the most important unit areas were 4Rd and 4Rc compared to 4Sw for the Quebec Lower North Shore (Division 4S). In the southern Gulf of St. Lawrence (Division 4T), most of the landings were made in unit areas 4Tl, 4Tf, and 4Tg. In Nova Scotia, Atlantic coast, the most important landings were made in 4Vn (Division 4V), 4Wd (Division 4W), and 4Xm (Division 4X). In 2011, the most important landings of the east coast of Newfoundland were from areas 3Kh and 3Ki with 271 t and 133 t compared to 612 t for the southern coast (3Pn) (Table 5; Figure 6). For the Gulf of St. Lawrence, the most important unit areas were 4Rb and 4Rc with 3,378 t and 1,575 t compared to 86 t and 80 t for 4Xo and 4Xm of the Scotian Shelf.

3.1.8 By division, gear and month

In 2011, most of the landings of Divisions 3K, 3L, and 4R were made with purse seines and Tuck-Ring seine during the months in October and November (Table 6). In Division 4T, they were mainly made using lines (all types) and gillnets between June and September. On the Scotian Shelf, in Division 4X, most of the landings were made using weir between May and July.

Since 1995, seine (all types) is the main fishing gear used in Divisions 3K, 3L and 4R (Table 7; Figures 7A, 7B, and 7D) compared with gillnets in Division 3P between 1995 and 2003, trap (and or weir) between 2004 and 2008, and seine since 2009 (Figure 7C). In Division 4S, seine and trap are the main fishing gears since 2007 (Figure 7E). In Division 4T, gillnets and lines (all types) are the main fishing gears (Figure 7F). In Divisions 4V and 4W, trap has gradually replaced gillnets and lines (Figures 7G and 7H) and it remains the main fishing gear used in Division 4X (Figure 7I).

3.1.9 Characteristics of the seine fishery in Newfoundland

On the west coast of Newfoundland (Division 4R), most of the purse seiners catches are realized along the coast, between St. Paul's Inlet and St. George's Bay (Figure 8). Tuck-Ring seines catches are rather localised in the bays of Bonne Bay, of Islands, and St. George. On the east coast (Divisions 3KL), purse seines catches are also made near the coast (except for some sets) between Roddickton and Lewisport (Figure 9). However, the most important catches are made near Roddickton or between Roddickton and Baie Verte. For the Tuck-Ring seines, the most important catches were realized in the Bonavista area in 2006, 2007, and 2010, Baie Verte in 2007 and 2009 and St. Anthony in 2009. Finally, on the south coast (Division 3P), most of the 2009 catches were realized by small and large seiners in the area of Channel Port-aux-Basques and in this area and further to the East (by small seiners only) in 2010 and in 2011 (Figure 10). There is no Tuck-Ring seine fishery on the south coast of Newfoundland.

The pattern of the fishing seasons varies from one year to the next. For the large and small seiners of the west coast of Newfoundland, the 2002 and 2003 seasons have been the earliest compared to the 2007 season for the Tuck-Ring seine fishery (Figures 11A, 11B, and 11C). For these fisheries, the 2010 season was the last one to end and the 2011 season the one that took the most time to start. On the east coast, the small purse seine and the Tuck- Ring fishery seasons of 2008 and 2009 were the earliest (Figures 12A and 12B). For the Tuck-Ring seine, the 2011 season is the one that took the most time to start.

The large seiners have a greater fishing capacity than small seiners although the last ones were responsible for the most important mackerel sets (Figure 13). Median catches of the large seiners are 85 t per set compared to 43 t and 20 t for small seiners and the Tuck-Ring seine.

3.1.10 Pattern of the fixed gear fishery

The fishery in unit area 4Tf (Magdalen Islands) is practiced in the spring with gillnets and during the fall with handlines and jiggers. Median landing dates indicate that fishing activities gradually took place later between 2000 and 2009 unlike subsequent years (Figure 14A). After a sharp reduction in 2000, landings gradually increased until 2003 and decreased again to less than 1,000 t since 2007 (Figure 14B). Landings in 2011 are the lowest to be observed since 1985. Unit area 4Tf is located in the middle of the Gulf of St. Lawrence (Figure 14C).

In unit area 4Tg, the fishery is conducted mainly in the fall with handlines and jiggers. Catches are also made in the spring using gillnets. The pattern of the median dates of the catches indicates that fishing activities in this unit area have varied little over the years (Figure 15A). Between 2000 and 2005, landings progressively increased (except in 2004) (Figure 15B). Landings are decreasing since 2005 and those of 2011 are the lowest of the series. Unit area 4Tg is located between the west coast of Cape Breton and the eastern coast of Prince Edward Island (Figure 15C).

In unit area 4Tl, most of the landings are made in the spring using gillnets. The duration of this fishery is short and occurs essentially at the same time from year to year. The gillnet fishery is followed by a line fishery. Median landing dates have not significantly changed over the years, except in 2005 (Figure 16A). Landings gradually increased between 1985 and 2002 (except in 1992, 1995, and 1999). They have been decreasing since 2002 to reach less than 2 t in 2011 (Figure 16B). Unit area 4Tl is located in the region between the east coast of New Brunswick and the west coast of Prince Edward Island (Figure 16C).

At the beginning of a season, the fishery in 4Tm is done with fixed or drift gillnets. Gillnets are replaced by lines at the fall. The median dates of landings have varied little between 1985 and 2003 before increasing later (Figure 17A). Landings can vary greatly from one year to the next with similar values during 2-3 consecutive years (Figure 17B). This area is associated with the western part of Chaleurs Bay (Figure 17C).

Unit area 4Tn is characterized by a spring fishery with fixed and drifted gillnets and a fall line fishery. Median landing dates remained relatively the same between 1985 and 2000 (Figure 18A). The 2005 season was the earliest and the 2006 to 2009 seasons occurred later. Landings presented a clear decreasing trend between 1990 and 2005 followed by an increasing trend until 2010 and a significant drop in 2011 (Figure 18B). Unit area 4Tn is associated with the eastern part of Chaleurs Bay (Figure 18C).

Most of the landings in subdivision 4Vn are made in the spring using traps and gillnets. There is also a line fishery during the fall and in the past, a small purse seine fishery. Median landing dates have not changed very much until 2002 but they declined thereafter (Figure 19A). Landings have been decreasing since 1990 and very low values are observed since 2001 (Figure 19B). Subdivision 4Vn is located on the east coast of Cape Breton (Figure 19C).

Unit area 4Xm is characterized by a trap fishery in the spring. Median dates have not really changed over the years before declining between 2003 and 2007 and increasing thereafter (Figure 20A). Despite annual variations, landings decreased between 1994 and 2002 (Figure 20B). They increased in 2003 before decreasing again until 2011. Very low landings are observed since 2008. Unit area 4Xm is located near Halifax and includes St. Margarets Bay and Mahone Bay, which are very important for the fishermen of this region (Figure 20C).

Mackerel landings in unit area 4Xo are highly variable and occur mainly during the spring. The median dates of landings are also highly variable since 1996 (Figure 21A). In this area, landings are generally lower than 500 t (except in 1988, 2004, 2005 and 2007) (Figure 21B). This unit area is located in the south western coast of Nova Scotia (Figure 21C).

3.1.11 Fixed and mobile gear catches in Nova Scotia

In Nova Scotia, the most important catches are realised in the regions of Halifax, Yarmouth and North Sydney (Figures 22-33). The Halifax area includes St. Margarets Bay and Mahone Bay of statistical districts 23 and 25 (Table 8) with average (1995-2010) annual landings of 1,145 and 749 t. The Yarmouth area includes district 33 with average annual landings of 440 t compared to 369 t for district 1 of the North Sydney area. In most of these districts, landings of the last years are well below the corresponding annual averages. The main fishing gears are the traps and gillnets which are used mainly within the 100 m isobath.

Mackerel by-catches are also made on a periodic basis by vessels using bottom trawls. Most of these catches are concentrated in an area off Halifax and outside the 100 m isobath (Figure 34). In 2006, mackerel catches were also made southeast of Halifax using midwater trawl (exploratory fishery) and in the Yarmouth region using purse seine.

3.1.12 Quotas by fleet and TAC

For several years, 40% of the Canadian portion of the TAC has been allocated to mobile gear over 65' (19.8 m) or for all exploratory fishing and 60% to mobile gear under 65' and to fixed gear such as traps, gillnets, lines and weirs (Table 9). In the first case, from 0.5 to 49 % of the quota was reached since 1995 and in the second case, up to 94% in 2004, 110% in 2005, 106% in 2006, and 98% in 2007. The excesses of the quota in 2005 and 2006 were a first since the introduction of a TAC for mackerel in NAFO Subareas 3 and 4 in 1987. These excesses were caused by the significant catches made by the small seiners and the fixed gears (Tables 3 and 9).

3.1.13 Nova Scotia Observers

The mackerel catches made since 2008 on the Scotian Shelf and recorded by the observers on Canadian vessels ranged from 116 kg to 3,587 kg (Table 10). The last catches on foreign vessels were recorded in 2004 for Russia with 10,736 kg.

Most of the catches by Canadian (and foreign vessels) are realised in May, June and July (Table 11) in unit areas 4Wk, 4Wl, 4Xp, 4Xq, and 4Xr (Table 12). The main fishing gears are purse seine and bottom trawl (Table 13). The most recent Canadian catches with these fishing gears are presented in Figure 35.

The most significant catches of mackerel by foreign countries were made by USSR, Cuba, Bulgaria and Russia (Figure 36A). The most intensive fishing period occurred between 1988 and 1993 (Figure 36B). The most significant catches were made in May (Figure 37A) in unit areas 4Wj and 4Wl (Figure 37B) with bottom trawl (OTB2) and midwater trawl (OTM2) (Figure 37C).

Between 1977 and 1998, the most significant mackerel catches by foreign vessels have been made when silver hake (*Merluccius bilinearis*) (code 14; Appendix 1) and mackerel (code 70) were the main species sought (Table 14; Figure 38A). For Canadian vessels, the most significant mackerel catches were made when fishing activities were directed to this species, Atlantic herring (*Clupea harengus harengus*) (code 60) and pollock (*Pollochius virens*) (code 16) (Table 15; Figure 38B).

3.2 BY-CATCHES FROM THE MULTIDISCIPLINARY GROUNDFISH SURVEYS

3.2.1 Scotian Shelf surveys

A winter groundfish multidisciplinary survey has been conducted on the Scotian Shelf and in particular in Divisions 4V and 4W since 1986 (Figure 39). During this survey, mackerel catches are generally made in the southwestern part of the sampled area. It is also in this area that the bottom water temperatures are the warmest (temperature data is not available for some surveys). The higher mean number per set were observed between 1990 and 1995 (except 1992) and in 1999, 2000, and 2007 (Figure 40A). Very low values are observed since 2008. Mean lengths of the catches have increased from 1988 to reach 35 cm in 1997 (Figure 40B).They were less than 26 cm between 1999 and 2003 and of more than 22 cm thereafter. In some cases, annual length frequencies are composed of some modes associated to different age groups (Figure 40C). These modes can sometimes be followed for some consecutive years.

Since 1986, a survey is also conducted on Georges Bank. Throughout the years, the most of the catches were made all around the contour of the Bank (Figure 41). With the exception of 1998 and 2001, very few mackerel were caught during this survey (Figure 42A). Mean lengths have not greatly changed between 1989 and 1997 with values near 20 cm (Figure 42B). Annual length frequencies are generally characterised by one or two main modes associated mostly to small sizes (Figure 42A).

A summer multidisciplinary survey is conducted annually since 1970. This survey covers all the Scotian Shelf with the exception of Georges Bank. Mackerel catches were made mostly in the area located offshore Halifax (Figure 43). This area is also associated with higher water temperatures. The highest mean numbers per set were observed between 1984 and 1997 and remain very low since (Figure 44A). The highest mean number coincided to the use of a new vessel (A. Needler). Mean length were increasing between 1972 and 1983 when the survey was conducted by the A. T. Cameron and the Lady Hammond (Figure 44B). Mean lengths have been decreasing between 1983 and 2005 and increasing until 2010. The measured value in 2011 is the lowest of the series. Length frequencies are characterized by one or some dominant modes (Figure 44C). For the A. T. Cameron survey, some of these modes were followed on several consecutive years. According to the corresponding sizes, these modes were associated to the dominant cohorts of 1967, 1969, and 1974.

The close relationship between the positions of mackerel catches and water temperature is highlighted when the annual data of each survey are grouped together (Figures 45A, 45B, and 45C). In the vast majority of cases, mackerel catches are associated with higher temperatures.

3.3 BIOLOGY

3.3.1 Catch at age and year-classes

Landings and biomass of the catch show similar values (Figure 46) which means the absence of major errors in the catch at age calculation. The ratios of the log values of the catch at age between consecutive age groups suggest a fishing mortality lower for fish aged one, two and three years (Figure 47). For all age groups, fishing mortalities increased from the late 1960s to the mid-1970s. Mortalities declined in the late 1970s and fluctuated slightly until the early 2000s for older age groups (4^+). Mortalities then increased and reached from 2005 values as high as in the mid-1970s (that period recorded the highest landings ever observed in the Atlantic Northwest). For age groups one and two, mortalities have shown a clear upward trend since 1987.

The 2011 catch at age is characterized by a very large number of 3, 4 and 6 years-old fish, i.e. from the 2008, 2007 and 2005 year-classes, with mean lengths of 33.5 cm, 34.9 cm, and 36.6 cm, and mean weights of 0.428 kg, 0.491 kg and 0.574 kg respectively (Table 16).

In the second quarter, the most important contribution was from the dominant year-class of 2008 with 65.7% of all the catch (Figure 48). On the third quarter, the two most significant year-classes were 2008 and 2010 with respective contributions of 39.1% and 31.3%. In the fourth quarter, the 2008 and 2007 year-classes dominated with respective contributions of 45.2% and 27.6% followed by the 2005 year-class with 15.3%.

Over the years, among the dominant year-classes, were those in particular of 1967, 1974, 1982, 1988 and 1999. (Tables 17-20). These year-classes have completely dominated the commercial catches for several years and were very apparent in the catch at age (Figure 49A). This is the case, in particular, of the 1999 year-class between 2000 and 2004 whose abundance has however declined from 2005 to be followed by year-classes that were rather quickly caught. This is the case of the 2003, 2005, 2007, and 2008 year-classes (Figures 49A and 49B) whose relative importance is higher than the average but lower than that of the dominant year-classes (Figure 49C). The average age of the catches decreased between 1994 and 2000 (Figure 49D). It increased in the early 2000s with the arrival and the aging of the 1999 year-class. The average age has increased slightly in 2011 after declining between 2003 and 2010.

3.3.2 1999 year-class

Between 2000 and 2003, annual landings attributed to the 1999 year-class varied from 5,920 t to 36,182 t which corresponds from 41% to 77% of all the Canadian landings (Figure 50A). They dropped from 31,029 t (61%), 24,961 t (45%), and 11,212 t (21%) in 2004, 2005, and 2006 to only 3,426 t (6%) and 748 t (2%) in 2007 and 2008. Among the year-classes that dominated the fishery over recent years, the 1999 year-class had the most significant cumulative catches at age (Figure 50B). At age 9 (2008), cumulative catches attributed to this one year-class were of 157,669 t.

3.3.3 Instantaneous rate of total mortality

The analysis of the catch curves at ages 3-7 showed that the 1999 dominant year-class is the one that had the highest instantaneous rate of total mortality (Figure 51). In a decreasing order of importance, this year-class was followed by the 1974, 1988, 1967, and 1982 dominant year-classes (Figure 52). At ages 3-6, the highest rate of mortality was calculated for the dominant 2005 year-class.

3.3.4 Length frequencies

With mackerel, each dominant year-class can be monitored by examining the modes present in the annual length frequency distributions. For example, this was the case for the 1974, 1982, 1988, 1996 (absent however from the Division 4R purse seine fishery samples), 1999, 2003, 2005, 2007 (this last being present only in the line and purse seine samples from Divisions 4T and 3KL), and 2008 year-classes (Figure 53).

The annual mean lengths of the gillnet catches varied little between 1987 and 2008 (Figure 54A). They were higher than the average of 364.9 mm (1976-2010) between 1979 and 1985 and 1987 and 1997, and lower than this average between 1998 and 2011. The lowest average lengths associated to this fishing gear were measured since 2009. The smallest mackerel are caught with line with a mean length (1985-2010) of 320.9 mm (Figure 54B). Mean lengths of the line catches are declining since 1993 and the values measured since 2003 are the lowest of the series. The mean length (1987-2010) of the purse seine catches of the West coast of Newfoundland is 348.8 mm. Annual mean lengths were higher than this value between 1987 and 1999 and below later (except 2004) (Figure 54C). Very low values and an increase in annual mean lengths were observed between 2000 and 2004 because of the importance of the catches associated with the dominant 1999 year-class. On the east coast of Newfoundland (Divisions 3KL), the mean length (2000-2009) of the purse seine catches was evaluated at 322.9 mm. Annual mean lengths were lower than this average in 2000 and 2004 and higher between 2005 and 2007 and in 2010 (Figure 54D). Annual length frequencies and annual mean lengths of all fishing gears (combined by weighting the catches) are similar to those of the west coast of Newfoundland purse seine fishery (Figures 55A and 55B) as this fishery is responsible for the most important catches.

The examination of length frequencies for each type of fishing gear also reveals that fish length only marginally varies when a year-class heavily dominates the fishery. This was the case for the 1982 year-class in 1987 and 1988 and for the 1999 year-class in 2003 (Figure 56). In addition, the length frequencies for mackerel caught with lines, a very low selective gear, can quickly detect a dominant year-class. This was observed in 1990 for the dominant year-class of 1988 compared with 1991 for gillnet, a highly selective gear. A similar situation was observed for the 1999 year-class in 2000 and 2001 in the length frequencies from the line and purse seine fisheries. The 1999 year-class was not seen in the gillnet length frequencies until 2002.

3.3.5 Fulton condition factor

For mackerel, condition is at its lowest in early June (day of the year 160) following long spring migrations and the beginning of the spawning activities, while the highest values are recorded in the fall (Figure 57A). The Fulton condition factor, measured in June, presents higher than average values (1973-2010) between 1973 and 1984 as well as in 1999, 2001, 2006 and since 2009 (Figure 57B). The annual variations of the condition factor are associated with the Cold Intermediate Layer (CIL) temperature index variations. The annual variations of the condition by age group (ages 3-9) (Figure 58A), length class (Figure 58B), and for the dominant year-classes (except for 1999 in 2000) (Figure 58C) are also similar to the variations of the CIL.

3.3.6 Weight and length at age

The lowest mean weight at age (ages 1-7) were observed during the 1960s and 1970s (Figure 59A). All weights at age increased between 1976 and the early 1980s (Figure 59B). After a decrease until the mid-1980s, the weights at age remained relatively stable.

Growth in length or weight has greatly varied from one period to the other (Figures 60A and 60B) and from one year to the next (Figures 61A and 61C). Growth in the first years is very fast so that at the end of the second year (age 1^+), the mean lengths and weights measured for example in 2011 reached 270.3 mm and 212.5 g (Figures 61B and 61D).

Growth also varies from one year-class to another. For example, it was slower for the dominant 1967, 1974, 1982, and 1988 year-classes. These year-classes are indicated by the dark lines of Figures 62A and 62B. These same year-classes can also be identified by examining the mean lengths calculated by year and age group (Figure 63).

3.3.7 Maturity at age

The proportion of mature fish at age has not varied much over the years (Figure 64A). Age at 50% maturity (A_{50}) increased from 1.35 in the 1980s to 1.48 and 1.40 in the 1990s and 2000s. In 2010 and 2011, A_{50} was 1.69 years (Figure 64B).

3.3.8 Maturity at length and minimum legal size of the catch

The proportion of mature fish at length has varied considerably over the years (Figure 65A). Length at 50% maturity (L_{50}) decreased from 272.91 mm to 259.57 mm between the 1970s and 1980s (Figure 65B). This length was 266.17 mm in the 1990s, before reaching a minimum of 245.03 mm in the 2000s. In 2010 and 2011, mean L_{50} was 273.92 mm. L_{50} was higher than the minimum legal catch size of 250 mm for most of the years of the period between 1974 and 2011 (Figure 66).

4. DISCUSSION

4.1 SOURCES OF UNCERTAINTY

4.1.1 Unrecorded catches

Mackerel that are caught using personal license for bait are not all recorded in the Department's official statistics. Recreational fishing is very popular in summer but these statistics are not recorded. Since these activities are carried out throughout eastern Canada, the actual total number of mackerel caught is considered to be largely underestimated.

4.1.2 Discards of small mackerel

The discarding of mackerel under the minimum legal catch size (250 mm) or below what industry requires is of concern. The extent of the discarding and the impact of this activity on the abundance of the year-classes at older ages are difficult to quantify.

4.1.3 Recent changes in migration patterns

Recent changes in mackerel migration and distribution may be responsible for the marked increase of landings on the east coast of Newfoundland (Divisions 3K and 3L) since 2004. This increase in landings was also accompanied by a drop in the catches in the southern Gulf of St. Lawrence as it is the case for example for the Magdalen Islands.

5. CONCLUSION AND ADVICE

The 1999 year-class supported the fishery like no other abundant year-class ever had since monitoring began in 1968. Despite the uncertainties concerning the fishery statistics and the results from recent egg surveys, it appears that this year-class no longer contributes to the fishery or to the spawning stock. The strength of the year-classes since 1999 are uncertain, but do not appear to be strong.

Catches in the order of 50,000 t in recent years have been supported by a strong year-class. It is uncertain that catches of that level can be realized with the year-classes presently available to the fishery.

Statistics on the fishery occurring in the southern Gulf of St. Lawrence would be improved by the use of mandatory logbooks in all the fisheries, including the mackerel bait fishery, or alternatively by a dockside monitoring program.

Recreational catches are certainly important and should be considered because this fishery is practiced by many people including many tourists along the Atlantic coast. In view of the possible changes in management of this activity and in order to improve statistics on fisheries overall, consideration should be given to developing methods to estimate these catches.

During the regular fishing activities, small mackerel (below the minimum legal size of capture) are sometimes accidentally caught along with the fish of commercial size. These small fish are discarded and not included in the landings. Measures, such relocation of fishing activities, would reduce the impact of the discards on the abundance of the year-classes and should be considered.

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7. REFERENCES

Anonymous. 1986. CAFSAC Assessment software catalog. CAFSAC Res. Doc. 86/96.

DFO. 2012. Assessment of the Atlantic Mackerel stock for the Northwest Atlantic (Subareas 3 and 4) in 2011. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/031.

Galbraith, P. S., Chassé, J., Gilbert, D., Larouche, P., Brickman, D., Pettigrew, B., Devine, L., Gosselin, A., Pettipas, R. G., and Lafleur, C. 2012. Physical oceanographic conditions in the Gulf of St. Lawrence in 2011. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/023. iii + 85 p.

Golden Software. 2012. Surfer, surface mapping system, version 10.7.972. Golden Software Inc. Golden, CO. USA.

Grégoire, F., Beaulieu, J.-L., Gendron, M.-H., and LeBlanc, D. 2012. Results of the Atlantic mackerel (*Scomber scombrus* L.) egg survey conducted on the Scotian Shelf and the southern coast of Newfoundland in 2009. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/127. iii + 25 p.

Grégoire, F., Beaulieu, J.-L. and Gendron, M.-H. 2013. Results of the Atlantic mackerel (*Scomber scombrus* L.) egg surveys conducted in the southern Gulf of St. Lawrence from 2008 to 2011. DFO Can. Sci. Advis. Sec. Doc. Res. Doc. 2013/035. v + 57 p.

Johnson, F. H. 1957. Northern pike year-class strength and spring water levels. Trans. Am. Fish. Soc. 86:285-293.

Ricker, W. E. 1980. Calcul et interprétation des statistiques biologiques des populations de poissons. Bull. Fish. Res. Board Can. 191F: 409 p.

TABLES

Table 1. *Annual landings (t) of Atlantic mackerel in NAFO Subareas 2 to 6 since 1960* [1].

ANNÉE / *YEAR*	**CANADA**		**ÉTATS-UNIS / *USA*** [4]			**TOTAL**
	Navires canadiens / *Canadian vessels* [2]	Navires étrangers / *Foreign vessels* [3]	Commercial / *Commercial*	Récréatif / *Recreational*	Autres Pays / *Other Countries*	
1960	5 888	0	1 396	2 478	0	**9 762**
1961	5 458	11	1 361	-	11	**6 841**
1962	6 901	64	938	-	175	**8 078**
1963	6 363	99	1 320	-	1 299	**9 081**
1964	10 786	174	1 644	-	801	**13 405**
1965	11 185	405	1 998	4 292	2 945	**20 825**
1966	11 577	1 244	2 724	-	7 951	**23 496**
1967	11 181	62	3 891	-	19 047	**34 181**
1968	11 134	9 720	3 929	-	65 747	**90 530**
1969	13 257	5 379	4 364	-	114 189	**137 189**
1970	15 710	5 296	4 049	16 039	210 864	**251 958**
1971	14 942	9 554	2 406	-	355 892	**382 794**
1972	16 254	6 107	2 006	-	391 464	**415 831**
1973	21 619	16 984	1 336	-	396 759	**436 698**
1974	16 701	27 954	1 042	-	321 837	**367 534**
1975	13 544	22 718	1 974	5 190	271 719	**315 145**
1976	15 746	17 319	2 712	-	223 275	**259 052**
1977	20 362	2 913	1 377	-	56 067	**80 719**
1978	25 429	470	1 605	-	841	**28 345**
1979	30 244	368	1 990	3 588	440	**36 630**
1980	22 136	161	2 683	2 364	566	**27 910**
1981	19 294	61	2 941	3 233	5 361	**30 890**
1982	16 380	3	3 330	666	6 647	**27 026**
1983	19 797	9	3 805	3 022	5 955	**32 588**
1984	17 320	913	5 954	2 457	15 045	**41 689**
1985	29 855	1 051	6 632	2 986	32 409	**72 933**
1986	30 325	772	9 637	3 856	26 507	**71 097**
1987	27 488	71	12 310	4 025	36 564	**80 458**
1988	24 060	956	12 309	3 251	42 858	**83 434**
1989	20 795	347	14 556	1 862	36 823	**74 383**
1990	19 190	3 854	31 261	1 908	30 678	**86 891**
1991	24 914	1 281	26 961	2 439	15 714	**71 309**
1992	24 307	2 417	11 775	284	0	**38 783**
1993	26 158	591	4 666	600	0	**32 015**
1994	20 564	49	8 917	1 705	0	**31 236**
1995	17 706	0	8 468	1 249	0	**27 424**
1996	20 394	0	15 812	1 340	0	**37 547**
1997	21 309	0	15 403	1 737	0	**38 449**
1998	19 334	0	14 525	690	0	**34 548**
1999	16 561	0	12 031	1 335	0	**29 927**
2000	16 080	0	5 649	1 448	0	**23 177**
2001	24 429	0	12 340	1 536	0	**38 305**
2002	34 662	0	26 530	1 294	0	**62 485**
2003	44 736	0	34 298	770	0	**79 804**
2004	53 777	0	54 990	530	0	**109 297**
2005	54 621	0	42 187	1 033	0	**97 841**
2006	53 649	0	56 640	1 633	0	**111 923**
2007	53 016	0	25 547	884	0	**79 446**
2008	29 671	0	21 734	691	0	**52 096**
2009	42 231	0	22 635	747	0	**65 613**
2010	38 753	0	9 891	778	0	**49 422**
2011 [5]	8 544	0	500	801	0	**9 845**
2012 [5]			5 000			**5 000**
Moyenne / *Average* : (1978-2010)	**28 460**	**405**	**16 364**	**1 748**	**7 770**	**54 695**

[1] Source OPANO 1960-1994; ZIFF 1995-2011 / *Source : NAFO 1960-1994; ZIFF 1995-2011*

[2] Inclut les ventes en mer / *Including over-the-side-sales*

[3] Inclut les prises avec allocations canadiennes / *Including catches with Canadian allocations*

[4] Source: Northeast Fisheries Science Center , Woods Hole, MA et / and Mid-Atlantic Fishery Management Council, Dover, DE

[5] Préliminaire / *Preliminary*

Table 2. *Annual landings (t) of Atlantic mackerel by province (NAFO Subareas 3-4) since 1995.*

PROVINCE	**ANNÉE / *YEAR***																	**MOYENNE / *AVERAGE***
	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011[1]**	(1995-2010)
Nouvelle-Écosse / *Nova Scotia*	6 681	5 517	5 669	4 562	4 797	4 547	4 058	3 989	7187	5 325	4 935	2 526	2 831	1 961	1 454	666	381	**4 169**
Nouveau-Brunswick / *New Brunswick*	2 206	2 684	1 990	1 682	1 373	972	2 199	2 182	1734	1 398	1 047	1 499	1 426	1 205	1 762	1 260	7	**1 664**
Île-du-Prince-Édouard / *Prince Edward Island*	2 518	4 018	6 693	6 784	3 842	4 134	5 979	6 088	4543	4 692	4 946	3 552	2 756	1 606	2 463	1 959	4	**4 161**
Québec	3 382	4 317	5 769	4 066	5 104	2 022	3 212	4 421	4597	1 979	1 221	1 818	1 750	1 863	2 316	1 709	821	**3 097**
Terre-Neuve / *Newfoundland*	2 919	3 857	1 188	2 149	1 445	4 406	8 981	17 982	26675	40 383	42 471	44 196	44 253	23 036	34 237	33 159	7 320	**20 709**
Non déterminé / *Unknown*	0	0	0	91	0	0	0	0	0	0	0	58	0	0.2	0.2	0.2	11	**9**
TOTAL	**17 706**	**20 394**	**21 309**	**19 334**	**16 561**	**16 080**	**24 429**	**34 662**	**44 736**	**53 777**	**54 621**	**53 649**	**53 016**	**29 671**	**42 231**	**38 753**	**8 544**	

[1] Préliminaire / *Preliminary*

Table 3. *Annual landings (t) of Atlantic mackerel (NAFO Subareas 3-4) by fishing gear since 1995.*

ENGIN / *GEAR*	**ANNÉE / *YEAR***																	**MOYENNE / *AVERAGE***
	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011[1]**	(1995-2010)
Chalut / *Trawl*	59	68	92	9	12	1	3	5	0	2	1	7	7	0	1	1	1	**17**
Chalut pélagique / *Midwater trawl*[2]	0	0	0	0	0	0	0	0	0	0	0	14	15	0	0	0	0	**2**
Senne "Tuck" / *Tuck-Ring Seine*	0	0	0	0	0	0	0	0	0	2 460	845	2 696	3 982	1 718	3 019	3 428	1 180	**1 134**
Senne Bourse / *Purse Seine* < 65'	1 415	1 853	801	1 406	1 044	3 431	4 518	10 833	11 686	25 338	28 232	29 161	26 731	15 659	20 552	20 688	4 501	**12 709**
Senne Bourse / *Purse Seine* > 65'	1 312	1 782	315	167	304	492	3 579	6 074	14 645	11 612	5 065	6 011	8 686	5 178	9 015	7 024	1 191	**5 079**
Autres Sennes / *Other Seines*	0	0	9	0	0	5	231	344	22	0	6 393	4 782	3 327	186	681	1 097	15	**1 067**
Filet maillant / *Gillnet*	4 481	6 420	6 657	7 638	5 128	5 297	6 610	4 958	4 542	4 734	3 930	4 509	3 629	2 475	3 472	2 736	378	**4 826**
Trappe / *Trap*	4 728	3 821	3 889	3 999	4 057	4 215	3 237	2 088	3 651	4 699	3 420	2 337	2 906	1 153	1 657	1 129	634	**3 187**
Palangre / *Longline*	0	0	0	7	3	4	20	19	16	4	61	48	0	9	3	0	10	**12**
Ligne à main / *Handline*	3 823	4 708	6 204	3 651	5 435	2 230	5 676	9 839	9 857	3 855	5 338	3 180	2 739	2 367	2 859	2 075	573	**4 615**
Turlutte / *Jigger*	899	1 231	3 029	1 998	569	90	200	129	9	694	1 118	877	321	62	0	0	0	**702**
Turlutte mécanisée / *Mechanized jigger*	0	0	0	0	0	0	0	0	0	1	1	0	0	270	729	386	39	**87**
Fascine / *Weir*	177	0	1	141	8	0	46	48	74	2	20	3	0	2	0	0	0	**33**
Autres / *Other*	812	510	313	320	0	311	308	326	217	363	191	2	651	549	157	160	0	**324**
Non déterminé / *Unknown*	0	0	0	0	0	6	0	0	18	12	4	22	23	43	88	31	21	**15**
TOTAL	**17 706**	**20 394**	**21 309**	**19 334**	**16 561**	**16 080**	**24 429**	**34 662**	**44 736**	**53 777**	**54 621**	**53 649**	**53 017**	**29 671**	**42 231**	**38 753**	**8 544**	

[1] Préliminaire / *Preliminary*

[2] Chalut pélagique, pêche exploratoire en Nouvelle-Écosse / *Midwater trawl, exploratory fishery in Nova Scotia*

Table 4. Annual landings (t) of Atlantic mackerel by NAFO Division and area since 1995.

DIVISION ET RÉGION /	ANNÉE / *YEAR*																	MOYENNE / *AVERAGE*
DIVISION AND AREA	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[1]	(1995-2010)
2J	0	0	0	0	0	13	0	0	0	0	0	0	26	0	0	0	0	**2**
3K	11	3	0	0	0	2 317	322	6 566	588	16 360	24 024	19 158	8 775	9 125	6 898	12 916	427	**6 691**
3L	11	0	0	0	0	55	10	3	0	59	4 068	7 960	10 340	4	39	830	37	**1 461**
3O	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0	0	0	**2**
3P	90	60	8	65	7	20	273	162	149	79	238	266	360	166	5 387	5 541	1 571	**804**
4R	2 807	3 794	1 181	2 175	1 438	2 001	8 375	11 251	25 938	23 885	14 141	16 799	24 726	13 741	21 913	13 871	5 296	**11 752**
4S	30	9	1	1	2	0	16	2	0	0	35	76	19	23	64	123	107	**25**
4T	8 184	11 358	15 358	12 739	10 562	7 316	12 316	14 484	14 324	9 152	9 424	7 788	6 385	5 439	6 815	4 919	725	**9 785**
4V	1 475	1 591	838	554	762	576	125	308	60	13	126	222	370	111	55	7	1	**449**
4W	622	1 182	716	138	126	120	248	115	9	59	36	75	59	63	65	129	14	**235**
4X	4 477	2 398	3 208	3 662	3 663	3 663	2 743	1 771	3 669	4 169	2 529	1 304	1 928	1 000	980	416	366	**2 599**
5YZ	0	0	0	0	0	1	0	0	0	0	0	0	0	0	16	0	0	**1**
Non déterminé / *Unknown*	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	**0**
Plateau néo-écossais (4VWX5YZ) / *Scotian Shelf (4VWX5YZ)*	**6 574**	**5 170**	**4 762**	**4 355**	**4 552**	**4 359**	**3 117**	**2 194**	**3 737**	**4 241**	**2 691**	**1 601**	**2 357**	**1 173**	**1 116**	**552**	**381**	**3 284**
Golfe du Saint-Laurent (4RST) / *Gulf of St. Lawrence (4RST)*	**11 021**	**15 161**	**16 540**	**14 914**	**12 002**	**9 317**	**20 707**	**25 737**	**40 262**	**33 037**	**23 600**	**24 663**	**31 129**	**19 203**	**28 792**	**18 913**	**6 128**	**21 562**
Côtes est et sud de Terre-Neuve (3KLP) / *Eastern and southern coasts of Newfoundland (3KLP)*	**112**	**63**	**8**	**65**	**7**	**2 405**	**605**	**6 731**	**737**	**16 498**	**28 330**	**27 384**	**19 529**	**9 295**	**12 324**	**19 288**	**2 035**	**8 961**
TOTAL	**17 706**	**20 394**	**21 309**	**19 334**	**16 561**	**16 080**	**24 429**	**34 662**	**44 736**	**53 777**	**54 621**	**53 649**	**53 016**	**29 671**	**42 231**	**38 753**	**8 544**	

[1] Préliminaire / *Preliminary*

Table 5. Landings (t) of Atlantic mackerel by NAFO Division, unit area, and subdivision since 1995.

DIVI-SION	Zone unitaire, sous-division / *Unit area, subdivision*	ANNÉE / *YEAR*																	MOYENNE / *AVERAGE* (1995-2010)
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[2]	
2J	2Jb	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	**1**
	2Jj	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0	**2**
	Total:	***0***	***0***	***0***	***0***	***0***	***13***	***0***	***0***	***0***	***0***	***0***	***0***	***26***	***0***	***0***	***0***	***0***	**2**
3K	3Ka	0	0	0	0	0	0	0	3	0	16	41	184	134	88	35	58	0	**35**
	3Kb	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	**0**
	3Kd	3	3	0	0	0	2 071	232	4 479	479	9 008	9 539	10 715	1 781	5 072	3 695	6 279	23	**3 335**
	3Kg	0	0	0	0	0	57	0	16	40	0	0	146	0	0	3	0	0	**16**
	3Kh	6	0	0	0	0	170	89	1 250	39	5 541	9 916	6 994	5 481	3 818	2 598	4 993	271	**2 556**
	3Ki	2	0	0	0	0	19	0	818	30	1 794	4 480	1 119	1 374	146	568	1 555	133	**744**
	3Ku[1]	0	0	0	0	0	0	0	0	0	0	49	0	0	0	0	32	0	**5**
	Total:	***11***	***3***	***0***	***0***	***0***	***2 317***	***322***	***6 566***	***588***	***16 360***	***24 024***	***19 158***	***8 775***	***9 125***	***6 898***	***12 916***	***427***	6 691
3L	3La	4	0	0	0	0	1	0	3	0	5	517	2 438	4 682	3	6	768	6	**527**
	3Lb	3	0	0	0	0	0	0	0		31	1 885	5 110	5 248	1	9	62	21	**823**
	3Ld	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	**0**
	3Lf	2	0	0	0	0	54	0	0	0	0	1 594	346	231	0	0	0	11	**139**
	3Lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	3Lj	2	0	0	0	0	0	0	0	0	10	73	33	0	0	0	0	0	**7**
	3Lq	0	0	0	0	0	0	10	0	0	13	0	26	145	0	0	0	0	**12**
	3Lu[1]	0	0	0	0	0	0	0	0	0	0	0	0	34	0	24	0	0	**4**
	Total:	***11***	***0***	***0***	***0***	***0***	***55***	***10***	***3***	***0***	***59***	***4 068***	***7 960***	***10 340***	***4***	***39***	***830***	***37***	1 461
3O	3Oa	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0	0	0	**2**
	Total:	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***27***	***0***	***0***	***0***	***0***	**2**
3P	3PSa	0	0	0	0	0	0	3	12	0	0	3	0	3	0	0	927	328	**59**
	3PSb	0	0	0	0	0	0	164	15	43	46	98	32	86	50	101	66	104	**44**
	3PSc	0	0	0	0	0	1	4		0	4	55	156	220	110	262	83	104	**60**
	3PSd	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	122	424	**8**
	3Pn	0	0	0	65	7	19	102	135	105	30	82	77	51	6	5 024	4 343	612	**628**
	3Pu[1]	90	60	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
	Total:	***90***	***60***	***8***	***65***	***7***	***20***	***273***	***162***	***149***	***79***	***238***	***266***	***360***	***166***	***5 387***	***5 541***	***1 571***	804

Table 5. *(Continued).*

DIVI-SION	Zone unitaire, sous-division / *Unit area, subdivision*	ANNÉE / *YEAR*																	MOYENNE / *AVERAGE* (1995-2010)
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[2]	
4R	4Ra	24	177	112	130	7	36	58	222	661	225	622	1 095	1 510	638	279	409	76	**388**
	4Rb	688	884	217	650	751	1 388	1 932	368	3 337	2 484	4 563	3 532	6 949	2 927	3 772	4 549	3 378	**2 437**
	4Rc	1 313	2 112	617	1 388	679	576	3 392	2 780	9 943	11 669	1 654	5 063	8 437	5 753	4 045	5 202	1 575	**4 039**
	4Rd	783	622	234	7	0	0	2 994	7 881	11 996	9 507	7 303	7 109	7 828	4 423	13 817	3 711	267	**4 889**
	4Ru[1]	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	**0**
	Total:	***2 807***	***3 794***	***1 181***	***2 175***	***1 438***	***2 001***	***8 375***	***11 251***	***25 938***	***23 885***	***14 141***	***16 799***	***24 726***	***13 741***	***21 913***	***13 871***	***5 296***	**11 752**
4S	4Sv	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	4Sw	0	0	0	1	0	0	16	2	0	0	35	76	18	23	64	123	107	**22**
	4Sy	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	4Sz	30	4	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	**2**
	Total:	***30***	***9***	***1***	***1***	***2***	***0***	***16***	***2***	***0***	***0***	***35***	***76***	***18***	***23***	***64***	***123***	***107***	**25**
4T	4Tf	2 925	3 805	5 257	3 268	4 662	1 328	2 837	3 750	3 921	976	729	1 331	581	429	807	447	172	**2 316**
	4Tg	600	844	2 861	2 510	826	446	2 104	3 172	4 215	2 092	3 992	1 540	781	1 088	596	371	3	**1 752**
	4Th	243	247	361	318	25	26	576	501	346	208	49	93	103	68	69	85	0	**207**
	4Tj	85	155	437	459	206	218	512	480	177	298	202	228	172	100	181	276	0	**262**
	4Tl	2 977	4 651	5 332	4 769	3 511	4 245	5 212	5 255	4 499	4 310	3 773	3 800	3 146	1 773	2 850	1 903	2	**3 875**
	4Tm	598	931	383	349	362	298	210	418	625	677	290	457	545	834	476	698	277	**509**
	4Tn	728	690	698	1 035	952	434	540	580	324	228	200	315	361	586	693	880	250	**578**
	4To	28	34	23	31	17	10	17	2	0	1	2	22	46	11	4	93	22	**21**
	4Tp	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	4Tq	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
	4Tu[1]	0	0	5	0	0	0	0	0	0	1	0	0	0	0	983	9	0	**62**
	Q	0	0	0	0	0	311	308	326	217	362	186	0	651	549	157	158	0	**201**
	Total:	***8 184***	***11 358***	***15 358***	***12 739***	***10 562***	***7 316***	***12 316***	***14 484***	***14 324***	***9 152***	***9 424***	***7 788***	***6 385***	***5 439***	***6 815***	***4 919***	***725***	**9 785**
4V	4Vn	1475	1591	835	554	757	576	125	308	59	10	125	222	367	111	51	6	1	**448**
	4Vs	0	0	0	0	0	0	0	0	0	0	0	2	3	0	4	1	0	**1**
	4Vu[1]	0	0	2	1	5	0	0	0	0	2	0	0	0	0	0	0	0	**1**
	Total:	***1475***	***1591***	***838***	***554***	***762***	***576***	***125***	***308***	***60***	***13***	***126***	***224***	***370***	***111***	***55***	***7***	***1***	**450**

Table 5. *(Continued).*

DIVISION	Zone unitaire, sous-division / *Unit area, subdivision*	ANNÉE / *YEAR*																	MOYENNE / *AVERAGE* (1995-2010)
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[2]	
4W	4Wd	396	976	395	50	85	115	236	83	7	47	5	1	7	11	8	5	2	**152**
	4Wg	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	**0**
	4Wh	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**0**
	4Wj	0	0	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	**2**
	4Wk	170	139	174	7	27	4	4	8	0	4	24	34	14	37	48	64	9	**47**
	4Wl	0	0	0	0	0	0	0	1	0	0	1	7	5	0	0	8	1	**1**
	4Wu[1]	56	67	147	81	15	0	9	23	2	7	6	3	32	14	9	53	2	**33**
	Total:	***622***	***1182***	***716***	***138***	***126***	***120***	***248***	***115***	***9***	59	***36***	***75***	59	***63***	***65***	***129***	***14***	235
4X	4Xm	4141	2342	3123	1886	3045	2362	981	680	2288	1856	946	503	712	116	131	71	80	**1 574**
	4Xn	1	1	1	0	0	0	0	33	0	0	3	0	58	13	22	43	0	**10**
	4Xo	3	0	11	414	104	248	34	21	3	1503	625	54	611	224	262	81	86	**262**
	4Xp	22	0	0	0	0	0	0	23	0	0	1	0	0	0	0	0	0	**3**
	4Xq	40	43	4	7	11	1	92		60	15	16	233	26	54	117	24	45	**50**
	4Xr	7	0	2	2	0	0	42	37	55	2	21	42	7	5	2	0	1	**14**
	4Xs	258	9	0	141	16	0	17	10	19	0	0	0	62	0	14	0	1	**34**
	4Xu[1]	5	2	67	1212	487	1051	1578	967	1243	793	917	472	452	587	433	197	153	**654**
	Total:	***4477***	***2398***	***3208***	***3662***	***3663***	***3663***	***2743***	***1771***	***3669***	***4169***	***2529***	***1304***	***1928***	***1000***	***980***	***416***	***366***	2 599
5	5u[1]	0	0	0	0	0	1	0	0	0	0	0	0	0	0	16	0	0	**1**
	TOTAL	**17 706**	**20 394**	**21 309**	**19 334**	**16 561**	**16 080**	**24 429**	**34 662**	**44 736**	**53 777**	**54 621**	**53 649**	**53 016**	**29 671**	**42 231**	**38 753**	**8 544**	

[1] "u" = zone unitaire ou sous-division non déterminée / *"u" = unknown unit area or subdivision.* [2] Préliminaire / *Preliminary*

[3] Récépissés supplémentaires d'achat, région du Québec / *Supplementary purchase slips, Quebec region*

Table 6. *Monthly landings (t) of Atlantic mackerel in 2011 by NAFO Division and fishing gear.*

DIVISION	ENGIN / *GEAR*	Jan.	Fev. / *Feb.*	Mars / *March*	Avril / *April*	Mai / *May*	Juin / *June*	Juillet / *July*	Août / *August*	Sept	Oct	Nov		TOTAL
3K	Senne bourse / *Purse Seine*								39	104	80	38		261
	Senne "Tuck" / *Tuck-Ring Seine*									10	1	115		126
	Autres sennes / *Other seines*									10	5	1		15
	Filet maillant / *Gillnet*									0	0			0
	Ligne (toutes) / *Line (all)*				1					5				6
	Trappe / *Trap*								14	1	3			18
3L	Senne bourse / *Purse Seine*								5		6			11
	Senne "Tuck" / *Tuck-Ring Seine*									4	20			24
	Filet maillant / *Gillnet*								1	0				1
	Ligne (toutes) / *Line (all)*								0					0
	Trappe / *Trap*								1	1	1			2
3P	Senne "Tuck" / *Tuck-Ring Seine*										274	1085		1359
	Filet maillant / *Gillnet*							0	4		0	1		5
	Ligne (toutes) / *Line (all)*								0	0				0
	Trappe / *Trap*								145	58	4			208
4R	Senne bourse / *Purse Seine*								5		4004			4008
	Senne "Tuck" / *Tuck-Ring Seine*								26		993	12		1031
	Filet maillant / *Gillnet*							0	2			0		2
	Ligne (toutes) / *Line (all)*				0	0		0	87	10	0			98
	Trappe / *Trap*							1	47	18	91			157
4S	Senne bourse / *Purse Seine*							0	19	34	1			54
	Filet maillant / *Gillnet*							0						0
	Ligne (toutes) / *Line (all)*									0				0
	Trappe / *Trap*							18	33					52
4T	Chalut de fond / *Bottom trawl*						0							0
	Filet maillant / *Gillnet*				0	0	187	27	55	6				275
	Ligne (toutes) / *Line (all)*	0	0	0	0	0	37	46	165	199	3	0	0	450
4V	Ligne (toutes) / *Line (all)*							0						0
	Autre / *Other*					0	1	0						1
4W	Chalut de fond / *Bottom trawl*			1	0	0					0			1
	Filet maillant / *Gillnet*					4	3							7
	Ligne (toutes) / *Line (all)*								1	3				3
	Trappe / *Trap*					2								2
							0.1							0
4X	Chalut de fond / *Bottom trawl*					0								0
	Filet maillant / *Gillnet*					40	17	0	9	16	3	1		87
	Ligne (toutes) / *Line (all)*							1	13	21	26	1		63
	Fascine / *Weir*					91	20	64	2	1	18			195
	Autre / *Other*					5	3	0.2	1	3	8			20

Table 6. *(Continued).*

DIVISION	**ENGIN / *GEAR***	**MOIS / *MONTH***											**TOTAL**
		Jan.	Fev. / *Feb.*	Mars / *March*	Avril / *April*	Mai / *May*	Juin / *June*	Juillet / *July*	Août / *August*	Sept.	Oct.	Nov.	
TOTAL	Chalut de fond / *Bottom trawl*	0	0	1	0	1	0	0	0	0	0	0	**1**
	Senne bourse / *Purse Seine*	0	0	0	0	0	0	0	68	138	4090	38	**4334**
	Senne "Tuck" / *Tuck-Ring Seine*	0	0	0	0	0	0	0	26	14	1287	1212	**2539**
	Autres sennes / *Other seines*	0	0	0	0	0	0	0	0	10	5	1	**15**
	Filet maillant / *Gillnet*	0	0	0	0	45	207	27	70	22	4	1	**377**
	Ligne (toutes) / *Line (all)*	0	0	0	1	0	37	48	265	239	30	1	**622**
	Trappe / *Trap*	0	0	0	0	2	0	19	240	79	98	0	**438**
	Fascine / *Weir*	0	0	0	0	91	20	64	2	1	18	0	**195**
	Autre / *Other*	0	0	0	0	5	4	0	1	3	8	0	**21**
GRAND TOTAL		**0**	**0**	**1**	**1**	**143**	**267**	**158**	**672**	**507**	**5540**	**1253**	**8543**

Table 7. *Annual landings (t) of Atlantic mackerel by NAFO Division and fishing gear since 1995.*

DIVISION	ENGIN / *GEAR*	ANNÉE / *YEAR*																
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[1]
2J	Senne bourse / *Purse Seine* < 65'						13							26				
	TOTAL	***0***	***0***	***0***	***0***	***0***	***13***	***0***	***0***	***0***	***0***	***0***	***0***	***26***	***0***	***0***	***0***	***0***
3K	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	11	1	0	0	0	1	0	258	36	62	138	52	63	0	9	47	0
	Ligne à main / *Hand Line*	0					1		1	2	4	331	51	100	6	6	49	
	Palangre / *Longline*						1		4	1		7	23	14		1		6
	Turlutte / *Jigger*						0		1	0	1	0	0			0	0	
	Senne bourse / *Purse Seine* < 65'	0					2 021	266	5 846	523	13 586	16 606	15 086	6 175	8 450	5 311	10 140	261
	Senne "Tuck" / *Tuck-Ring Seine*											565	913	448	477	849	1 513	126
	Autres sennes / *Other Seines*						0		313	11	2 160	5 958	2 811	1 957	[illegible]	681	1 095	15
	Trappe / *Trap*	0	2				293	55	143	15	547	418	221	18	5	40	72	18
	TOTAL	***11***	***3***	***0***	***0***	***0***	***2 317***	***322***	***6 566***	***588***	***16 360***	***24 024***	***19 158***	***8 775***	***9 125***	***6 898***	***12 916***	***427***
3L	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	8	0				1	0	3		1	94	54	39	3	4	49	1
	Ligne à main / *Hand Line*										1	43	20	2	0	0	22	0
	Palangre / *Longline*											12	3					
	Turlutte mécanisée / *Mechanized Jigger*										0	0	0		0			
	Senne bourse / *Purse Seine* < 65'	3					49	10			37	3 310	5 371	8 248		33	395	11
	Senne "Tuck" / *Tuck-Ring Seine*											43	321	696			323	24
	Autres sennes / *Other Seines*						4					310	1 971	1 311			2	
	Trappe / *Trap*						1				21	255	220	43	1	2	39	2
	TOTAL	***11***	***0***	***0***	***0***	***0***	***55***	***10***	***3***	***0***	***59***	***4 068***	***7 960***	***10 340***	***4***	***39***	***830***	***37***
3O	Senne bourse / *Purse Seine* < 65'													27				
	TOTAL	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***27***	***0***	***0***	***0***	***0***
3P	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	87	56	7	43	7	18	103	146	106	18	83	77	45	7	7	1	5
	Ligne à main / *Hand Line*	3		0	22	0	0	0			12	43		8				0
	Palangre / *Longline*	0			0	0		2	2	3	1	1		0				
	Turlutte mécanisée / *Mechanized Jigger*																	0
	Senne bourse / *Purse Seine* < 65'		4					75		18	4	20	28	9	4	3 149	3 785	1 266
	Senne bourse / *Purse Seine* > 65'															1 868	1 606	93
	Senne "Tuck" / *Tuck-Ring Seine*											0	1	1				
	Autres sennes / *Other Seines*							4			12			56				
	Trappe / *Trap*	0					1	88	15	22	32	90	160	240	155	363	149	208
	TOTAL	***90***	***60***	***8***	***65***	***7***	***20***	***273***	***162***	***149***	***79***	***238***	***266***	***360***	***166***	***5 387***	***5 541***	***1 571***

Tableau 7. (Continued).

DIVISION	ENGIN / *GEAR*	ANNÉE / *YEAR*																
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[1]
4R	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	103	133	29	299	64	97	33	52	21	51	15	25	33	0		2	
	Ligne à main / *Hand Line*	24	75	16	149	14	3	15	25	51	133	183	355	388	22	100	64	94
	Palangre / *Longline*				5	3		17	3	11	3	39	22	0	9	2		4
	Turlutte / *Jigger*	3	6			1			0	0								
	Senne bourse / *Purse Seine* < 65'	1 345	1 770	760	1 398	1 036	1 348	4 166	4 982	11 128	11 710	8 287	8 663	12 231	7 205	12 034	6 305	2 910
	Senne bourse / *Purse Seine* > 65'	1 312	1 782	315	167	304	492	3 579	6 051	14 645	11 612	5 065	5 742	8 686	5 178	7 142	5 418	1 098
	Senne "Tuck" / *Tuck-Ring Seine*											237	1 461	2 836	1 241	2 170	1 592	1 031
	Autres sennes / *Other Seines*			9	0			227	31	12	288	126		3				
	Trappe / *Trap*	20	28	51	157	16	62	337	107	70	87	190	530	547	87	465	489	157
	TOTAL	***2 807***	***3 794***	***1 181***	***2 175***	***1 438***	***2 001***	***8 375***	***11 251***	***25 938***	***23 885***	***14 141***	***16 799***	***24 726***	***13 741***	***21 913***	***13 871***	***5 294***
4S	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	0	2			2	0	13	1		0	23	27	2		7	0	0
	Ligne à main / *Hand Line*							0	0						0		1	0
	Senne bourse / *Purse Seine* < 65'							0				8	13	14		23	63	54
	Trappe / *Trap*				0			3	1			4	36	3	20	34	60	52
	Autre / *Other*	29	7	1	0										2			
	TOTAL	***30***	***9***	***1***	***1***	***2***	***0***	***16***	***2***	***0***	***0***	***35***	***76***	***19***	***23***	***64***	***123***	***107***
4T	Chalut de fond à panneaux / *Bottom Otter Trawl*																	0
	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	3 690	5 558	5 925	7 042	4 659	4 773	6 309	4 321	4 263	4 414	3 398	4 164	3 180	2 306	3 203	2 430	275
	Ligne à main / *Hand Line*	2 753	4 021	6 041	3 352	5 328	2 131	5 497	9 703	9 799	3 669	4 712	2 722	2 227	2 249	2 707	1 922	411
	Palangre / *Longline*	0	0		2		3	1		1		1	0					
	Turlutte / *Jigger*	897	1 226	3 029	1 998	567	90	200	127	9	694	1 118	877	321	62			
	Turlutte mécanisée / *Mechanized Jigger*														270	729	385	39
	Senne bourse / *Purse Seine* < 65'	44	33	8	8				5	17								
	Trappe / *Trap*	20	17	42	17	7	3		2								12	
	Casier / *Pot*	0		3			6		0	18	12	4	19	5	1	20	9	
	Fascine / *Weir*			1		0							0					
	Q[2]						311	308	326	217	362	186	0	651	549	157	158	0
	Autre / *Other*	780	503	312	320						1	6	6		2		2	
	TOTAL	***8 184***	***11 358***	***15 361***	***12 739***	***10 562***	***7 316***	***12 316***	***14 484***	***14 324***	***9 152***	***9 424***	***7 788***	***6 385***	***5 439***	***6 615***	***4 919***	***725***
4V	Chalut de fond à panneaux / *Bottom Otter Trawl*						0											
	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	29	95	9	26	118	42	5	12	13	4	7	8	11	2	1	0	
	Ligne à main / *Hand Line*	920	590	103	96	50	6	49	15	4	9	8	3	4	17	4	1	0
	Palangre / *Longline*						0		9									
	Turlutte / *Jigger*					1			1									
	Senne bourse / *Purse Seine* < 65'	4	45	33														
	Trappe / *Trap*	522	860	692	433	592	527	71	270	43		110	210	350	83	29		
	Autre / *Other*	0	0											5	9	21	6	1
	TOTAL	***1 475***	***1 591***	***838***	***554***	***762***	***576***	***125***	***308***	***60***	***13***	***126***	***222***	***370***	***111***	***55***	***7***	***1***

Tableau 7. *(Continued).*

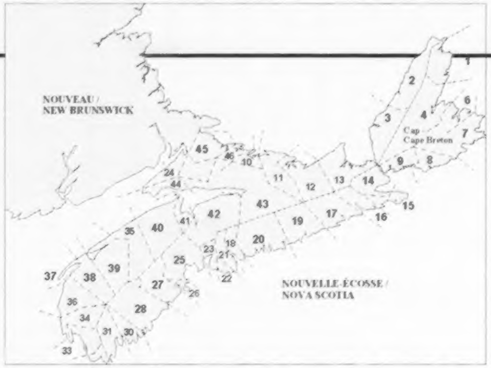
DIVISION	ENGIN / *GEAR*	ANNÉE / *YEAR*																
		1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011[1]**
4W	Chalut de fond à panneaux / *Bottom Otter Trawl*	51	67	92	8	12	0	3	2	0	2	1	7	6	0	1	1	1
	Chalut pélagique / *Midwater trawl*												14					
	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	377	480	265	33	35	32	19	35	6	13	17	15	28	41	51	121	7
	Ligne à main / *Hand Line*	33	13	3	1	6		15	8		0	9	12	4	12	6	2	3
	Senne bourse / *Purse Seine* > 65'												25					
	Trappe / *Trap*	159	621	357	97	74	87	212	70	3	44	9	3	21	10	7	4	2
	Autre / *Other*	2														2	1	0
	TOTAL	***622***	***1 182***	***716***	***138***	***126***	***120***	***248***	***115***	***9***	***59***	***36***	***75***	***59***	***63***	***65***	***129***	***14***
4X	Chalut de fond à panneaux / *Bottom Otter Trawl*	8	1	0	1	0	1	0	2	0	0	0	0	1	0	0	0	0
	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	177	94	422	196	243	333	127	131	97	172	155	85	228	115	176	85	87
	Ligne à main / *Hand Line*	91	9	40	31	37	89	100	87	0	28	10	17	5	62	36	13	63
	Palangre / *Longline*	0	0					0			0				0			0
	Senne bourse / *Purse Seine* < 65'	18				8												
	Senne bourse / *Purse Seine* > 65'								23				243			5		
	Trappe / *Trap*	4 006	2 293	2 745	3 294	3 368	3 240	2 470	1 481	3 497	3 968	2 344	956	1 683	793	717	303	195
	Fascine / *Weir*	177			141	7		46	48	74	2	20	3		2			
	Autre / *Other*													11	29	46	15	20
	TOTAL	***4 477***	***2 398***	***3 208***	***3 662***	***3 663***	***3 663***	***2 743***	***1 771***	***3 669***	***4 169***	***2 529***	***1 304***	***1 928***	***1 000***	***980***	***416***	***366***
5Y	Autre / *Other*															16		
	TOTAL	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***16***	***0***	***0***
Autre / *Other*	Autre / *Other*												2					
	TOTAL	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***2***	***0***	***0***	***0***	***0***	***0***
TOTAL	Chalut de fond à panneaux / *Bottom Otter Trawl*	59	68	92	9	12	1	3	5	0	2	1	7	7	0	1	1	1
	Chalut pélagique / *Midwater trawl*	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
	Filet maillant (fixe ou dérivant) / *Gillnet (fixed or drift)*	4481	6420	6657	7638	5128	5296	6610	4958	4542	4734	3930	4507	3629	2475	3456	2736	375
	Ligne à main / *Hand Line*	3823	4708	6204	3651	5435	2230	5676	9839	9857	3855	5338	3180	2739	2367	2859	2075	573
	Palangre / *Longline*	0	0	0	7	3	4	20	19	16	4	61	48	15	9	3	0	10
	Turlutte / *Jigger*	899	1231	3029	1998	569	90	200	129	9	695	1118	877	321	62	0	0	0
	Turlutte mécanisée / *Mechanized Jigger*	0	0	0	0	0	0	0	0	0	0	0	0	0	270	729	385	39
	Senne bourse / *Purse Seine* < 65'	1415	1853	801	1406	1044	3431	4518	10833	11686	25338	28232	29161	26731	15659	20552	20688	4501
	Senne bourse / *Purse Seine* > 65'	1312	1782	315	167	304	492	3579	6074	14645	11612	5065	6010	8686	5178	9015	7024	1191
	Senne "Tuck" / *Tuck-Ring Seine*	0	0	0	0	0	0	0	0	0	0	845	2696	3982	1718	3019	3428	1180
	Autres sennes / *Other Seines*	0	0	9	0	0	5	231	344	22	2460	6393	4782	3327	186	681	1097	15
	Trappe / *Trap*	4727	3821	3889	3999	4057	4215	3237	2088	3651	4699	3420	2337	2906	1153	1657	1129	634
	Casier / *Pot*	0	0	3	0	0	6	0	0	18	12	4	19	5	1	20	9	0
	Fascine / *Weir*	177	0	1	141	8	0	46	48	74	2	20	3	0	2	0	0	0
	Autre / *Other*	812	510	313	320	0	0	0	0	0	1	6	8	16	41	84	24	21
	Q[2]						311	308	326	217	362	186	0	651	549	157	158	0
	GRAND TOTAL	***17707***	***20394***	***21309***	***19334***	***16561***	***16080***	***24429***	***34662***	***44736***	***53777***	***54621***	***53649***	***53016***	***29671***	***42231***	***38753***	***8544***

[1] Préliminaire / *Preliminary*

[2] Récépissés supplémentaires d'achat, région du Québec / *Supplementary purchase slips, Quebec region*

Table 8. *Annual landings (t) of Atlantic mackerel for the statistical districts of Nova Scotia since 1995.*

ANNÉE /	**DISTRICT STATISTIQUE / *STATISTICAL DISTRICT***																																						**TOTAL**
YEAR	**1**	**2**	**3**	**4**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**25**	**26**	**27**	**28**	**30**	**31**	**32**	**33**	**34**	**36**	**37**	**40**	**43**	**44**	**45**	**46**	**90**[1]	
1995	751	167	43	144	238	370	69	92	0	5	3	59	53	202	10	43	51	0	83	0	202	2 421	1 518	1	3	0	0	5	0	6	64	0	4	0	0	0	29	1	44	**6 681**
1996	1 052	189	62	69	136	360	27	107	0	0	1	64	77	754	11	42	36	0	63	0	57	1 125	1 156	0	8	1	0	20	0	44	0	0	0	0	0	0	8	2	47	**5 517**
1997	760	615	153	62	9	37	15	121	0	3	6	100	47	292	0	130	0	1	66	0	736	1 385	977	33	21	4	0	2	7	0	4	2	0	0	0	0	2	0	78	**5 669**
1998	472	207	85	34	14	47	7	6	0	2	3	27	12	103	17	0	0	0	18	0	366	1 422	1 070	27	42	2	0	1	30	530	9	0	0	0	0	0	4	0	7	**4 562**
1999	709	124	62	21	10	17	2	9	0	1	1	25	60	95	0	2	0	0	19	0	375	1 822	1 220	19	58	11	0	2	12	106	5	0	0	0	0	0	1	0	10	**4 797**
2000	562.9	127	39	16	3	6	1	26	0	0	2	5	4	87	0	1	0	0	4.08	0	436	1 188	969	54	77	28	0	0	0	910	1	0	0	0	0	0	0	0	0	**4 547**
2001	194	322	178	25	3	21	0	13	5	2	20	285	58	188	0	0	0	0	0	0	294	1 264	799	33	41	31	0	3	0	223	7	0	1	41	0	0	2	5	0	**4 058**
2002	361	258	358	4	13	16	0	7		10	73	1 005	87	19					0		106	762	678	25	26	23	0	2	62	49			1	36		1	4	1	2	**3 989**
2003	137	146	266	0	5	5	1	5			7	2 921	19	1							118	2 171	691	4	3	0		0	0	608	0			53		21	1	4		**7 187**
2004	7	91	441	6	3	2		6	0		2	538	46					1	7		188	1 484	931	25	17	3		0	4	1 502	15			2			2	2		**5 325**
2005	144	243	1 053	3	1	10	0	3	0		1	909		5		0			8		105	885	590	13	5	5		0	1	864	59	1		20	0		3	2		**4 936**
2006	59	350	442							1 256		147								243	25																3			**2 526**
2007	436	79	278	12	1	4						29	7	3				3	24		60	765	453	13	3	5		0	3	606	35	9		0			3			**2 831**
2008	158	104	506	3	3	13	0					113	10	2			2	3	29		65	294	56	13	5	33	0		2	462	58	2		24						**1 961**
2009	82	5	303	0		10						0	7	1		23	1	1	43		101	100	48	18	4	5		1	43	526	120	12		0						**1 454**
2010	24	69	27	1	0	1		0				0	4	1		0		2	112		46	92	78	8	1			0	1	157	27	9	4			0	0			**666**
2011	1				0	0	0							2					8	81		45	71	12	2	15			1	88	55	1	0						0	**381**
Moyenne / ***Average*** (1995-2010)	**369**	**193**	**268**	**27**	**31**	**61**	**11**	**33**	**1**	**142**	**11**	**389**	**35**	**125**	**6**	**24**	**10**	**1**	**34**	**30**	**205**	**1 145**	**749**	**19**	**21**	**11**	**0**	**3**	**11**	**440**	**29**	**3**	**1**	**13**	**0**	**2**	**5**	**1**	**23**	



[1] Non déterminé / *Unknown*

Table 9. Annual landings (t) of Atlantic mackerel by fishing gear type and allocation.

ALLOCATION	ENGIN / *GEAR*	ANNÉE / *YEAR*																	MOYENNE / *AVERAGE*
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011[1]	(1995-2010)
40%	Chalut pélagique / *Midwater trawl*	0	0	0	0	0	0	0	0	0	0	0	14	15	0	0	0	0	**2**
	Senne bourse / *Purse seine* >65'	1 312	1 782	315	167	304	492	3 579	6 074	14 645	11 612	5 065	6 011	8 686	5 178	9 015	7 024	1 191	**5 079**
	Total	**1 312**	**1 782**	**315**	**167**	**304**	**492**	**3 579**	**6 074**	**14 645**	**11 612**	**5 065**	**6 024**	**8 702**	**5 178**	**9 015**	**7 024**	**1 191**	**5 081**
	TAC	*40 000*	*40 000*	*40 000*	*40 000*	*40 000*	*40 000*	*30 000*	*30 000*	*30 000*	*30 000*	*30 000*	*30 000*	*30 000*	*30 000*	*30 000*	*24 000*	*24 000*	**33 375**
	% capturé / *caught*	**3**	**4**	**1**	**0**	**1**	**1**	**12**	**20**	**49**	**39**	**17**	**20**	**29**	**17**	**30**	**29**	**5**	**17**
60%	Senne bourse / *Purse seine* <65'	1 415	1 853	801	1 406	1 044	3 431	4 518	10 833	11 686	25 338	28 232	29 161	26 731	15 659	20 552	20 688	4 501	**12 709**
	Autres / *Others*	14 980	16 760	20 193	17 762	15 213	12 158	16 332	17 755	18 405	16 827	21 323	18 464	17 584	8 835	12 665	11 041	2 851	**16 019**
	Total	**16 394**	**18 612**	**20 994**	**19 168**	**16 257**	**15 589**	**20 850**	**28 588**	**30 091**	**42 164**	**49 555**	**47 625**	**44 316**	**24 493**	**33 217**	**31 729**	**7 353**	**28 728**
	TAC	*60 000*	*60 000*	*60 000*	*60 000*	*60 000*	*60 000*	*45 000*	*45 000*	*45 000*	*45 000*	*45 000*	*45 000*	*45 000*	*45 000*	*45 000*	*36 000*	*36 000*	**50 063**
	% capturé / *caught*	**27**	**31**	**35**	**32**	**27**	**26**	**46**	**64**	**67**	**94**	**110**	**106**	**98**	**54**	**74**	**88**	**20**	**61**
	GRAND TOTAL	**17 706**	**20 394**	**21 309**	**19 334**	**16 561**	**16 080**	**24 429**	**34 662**	**44 736**	**53 777**	**54 621**	**53 649**	**53 017**	**29 671**	**42 231**	**38 753**	**8 544**	**33 808**

[1] Préliminaire / *Preliminary*

Table 10. *Annual catches (kg) of Atlantic mackerel by country of origin from the data of the Nova Scotia Observer Program since 1977*[1].

ANNÉE / YEAR	PAYS D'ORIGINE / *COUNTRY OF ORIGIN*													TOTAL
	Bulgarie / *Bulgaria*	Canada / *Canada*[2]	Cuba / *Cuba*	France / *France*	Rép. Dém. Allemande / *German Dem. Rep.*	Italie / *Italy*	Japon / *Japan*	Norvège / *Norway*	Pologne / *Poland*	Portugal / *Portugal*	URSS / *USSR*	Lithuanie / *Lithuania*	Russie / *Russia*	
1977			41 984				1 653				10 059			**53 696**
1978	14 331	4 540	19 597		40		4 739			370	125 956			**169 573**
1979	4 422	52	59 303				73				95 662			**159 512**
1980	187	1 796	21 168				140			1	92 940			**116 231**
1981		802	2 564			97				960	13 584			**18 007**
1982		941	1 252								3 839			**6 032**
1983		4 257	105				5				1 874			**6 241**
1984		643	18 022	5[3]						1 576	297 447			**317 694**
1985		1 212	31 818	2[4]						4 501	389 623			**427 156**
1986		475	18 585								265 412			**284 472**
1987		44	21 358								26 257			**47 659**
1988		7 729	123 488						191 260		584 412			**906 889**
1989		6 380	107 471						54 539		311 362			**479 752**
1990	1 259 071	1 183	327 246	5[3]			918	10	7 177		2 040 357			**3 635 967**
1991		3 259	54 428				801				1 001 300		218	**1 060 006**
1992		42 464	293 711				7 128					705 348	1 235 492	**2 284 143**
1993		1 073	613 782										36 267	**651 122**
1994		2 014	41 684											**43 698**
1995		1 043	58 259											**59 302**
1996		1 784	76 727										4 784	**83 295**
1997		294	109 045											**109 339**
1998		201	6 695										210	**7 106**
1999		20	13 367										7	**13 394**
2000		564											66	**630**
2001		3 349											2 916	**6 265**
2002		18 643											1 193	**19 836**
2003		3 335		30[3]									6 087	**9 452**
2004		2 320											10 736	**13 056**
2005		191												**191**
2006		39 319												**39 319**
2007		1 646												**1 646**
2008		116												**116**
2009		283												**283**
2010		475												**475**
2011		3 587												**3 587**
NK[5]			45											**45**
TOTAL	**1 278 011**	**166 033**	**2 061 704**	**42**	**40**	**97**	**15 457**	**10**	**252 976**	**7 408**	**5 260 085**	**705 348**	**1 297 976**	**11 035 187**

[1] Couverture à 100 % sur les navires étrangers depuis 1987; tous les types de traits sont présentés / *A 100 % coverage on the foreign vessels since 1987, all type of hauls are presented*

[2] Données non présentes dans les fichiers ZIFF, du moins à partir de 1990 / *Data not present in the ZIFF files, at least since 1990*

[3] Saint-Pierre et/*and* Miquelon

[4] Continent / *Mainland*

[5] Non déterminé / *Unknown*

Table 11. Monthly catches (kg) of Atlantic mackerel from the data of the Nova Scotia Observer Program since 1977.

ANNÉE /	**MOIS / *MONTH***													**TOTAL**
YEAR	1	2	3	4	5	6	7	8	9	10	11	12	NK[1]	
1977				963	37 476	3 003	10 383	218	1 653					**53 696**
1978				102	5 880	25 593	73 755	61 284	1 810	30	831	288		**169 573**
1979					28 822	50 669	77 979	1 902	119	4	17			**159 512**
1980		15		6 596	102 944	1 958	2 689	337		15	1 650	28		**116 231**
1981			121	10	3 462	12 628	1 343	1	55	133	206	48		**18 007**
1982	16	1	75	171	4 946	83	127	25	1	130	192	266		**6 032**
1983	5		535	532	1 157	312	3 506	1	50	90	47	6		**6 241**
1984	2	20	3	6	13 064	38 686	202 933	62 730	140	109				**317 694**
1985	40		72	323	185 334	116 037	74 781	50 371	163	3	32			**427 156**
1986		10		3	142 367	79 711	60 913	1 334	45	89				**284 472**
1987				5	44 873		2 752		29					**47 659**
1988			4 190	77 685	489 090	199 936	135 821	158		2		7		**906 889**
1989	145	10		17 503	104 823	346 532	7 410	3 190	29	110				**479 752**
1990	1	18	17 141	545 276	2 514 689	543 193	10 533	9	259	4 831	12	5		**3 635 967**
1991	5	35	234	238 756	172 619	58 731	155	129	2 298	586 952	76	16		**1 060 006**
1992	111		19	412 293	1 138 740	26 563	893	25		361 038	344 461			**2 284 143**
1993		96	9 690	153 378	186 386	293 508	7 526	460		47	11	20		**651 122**
1994	4	1	51	860	29 163	13 055	68	12	280	1	1	202		**43 698**
1995	78		10	17 225	33 028	2 920	6 018	17	3	3				**59 302**
1996	6		7 404	26 779	45 463	2 568	1 038	10	14	6	1	6		**83 295**
1997	1	19 087	20 430	13 921	37 834	16 587	1 464	10	3			2		**109 339**
1998			2	57	13	6 994	33		0	2		5		**7 106**
1999	4 636	4 334	1 840	1 279	689	264	343			1		8		**13 394**
2000	20	4	2	6	54	360	150	7	1		22	4		**630**
2001			2 912	3	46	1 025	66		3	1 601	605	4		**6 265**
2002	6	28	139		6 663	479	193	4	12 250	4	13	57		**19 836**
2003	9	60	2 879	3 304	2	67	3 125		2	0	3	1		**9 452**
2004	1	9 447	1 292	12	118	1 537	595		0	2		52		**13 056**
2005			12	1	3	64	35		75		1			**191**
2006	1 129	51	2 533	2 200	8 508	8 861	12 549	3 406	80	0	1	1		**39 319**
2007	53	168	20	447	820	106	32							**1 646**
2008			1		24	20	70			0	1			**116**
2009	1			2	9	10	253		4		1	3		**283**
2010	6	3	76	28	72	166	120	3		1				**475**
2011	5	5	16	70	3 196	2	261	32						**3 587**
NK[1]													45	**45**
TOTAL	**6 280**	**33 393**	**71 699**	**1 519 796**	**5 342 378**	**1 852 228**	**699 912**	**185 675**	**19 366**	**955 204**	**348 183**	**1 029**	**45**	**11 035 187**

[1] Non déterminé / *Unknown*

Table 12. Annual catches (kg) of Atlantic mackerel by NAFO Division, subdivision, and unit area from the data of the Nova Scotia Observer Program since 1977.

ANNÉE /	DIVISION, SOUS-DIVISION, ZONE UNITAIRE / *DIVISION, SUBDIVISION, UNIT AREA*												
YEAR	2J	3O	3Pn	3Ps	4Ru[1]	4Su[1]	4Vbc	4Vn	4Vs	4We	4Wf	4Wg	4Wh
1977					0	0	0	0	0	0	1	0	0
1978		1					50	6	433	105			2 860
1979									7				
1980									1		100	2 593	
1981						5			52	134	1	213	61
1982	20								160	66	25	177	203
1983						30		10	68	80	5		3 305
1984				10		6			174	144	1 837	171 444	107
1985					2			1	902	20	2 877	166 692	160
1986									367		2 995	17 440	14
1987									9			15	
1988									43		39	36 894	5
1989								2	107	1 625	1 365	2 000	32
1990								4 815	116	5 743	2 405	172 613	60 150
1991								1 800		4 252	309 185	1 995	273 066
1992								54 816	283	251 533	399 160	154 297	585
1993			14		1			122	6		371	48 756	59
1994					2	1		7				115	235
1995									5		27	2 693	54
1996									3			1 105	140
1997									1		60	1 627	10
1998								6				5	
1999												58	1
2000													5
2001								1					1 000
2002							0						1
2003								1					73
2004										0			1 362
2005										1			19
2006					0	0	260	2	0	0	5	1 141	16 332
2007							9						101
2008									0.9		0.1		27
2009							0.3	4		0.2			
2010	1												43
2011										2			3
NK[2]													
TOTAL	21	1	14	10	5	42	320	61 593	2 737	263 705	720 458	781 873	360 013

[1] "u" = non déterminé / *"u" = unknown*

[2] Année non déterminée / *Year unknown*

Table 12. (Continued).

ANNÉE /	DIVISION, SOUS-DIVISION, ZONE UNITAIRE / *DIVISION, SUBDIVISION, UNIT AREA*												
YEAR	4Wj	4Wk	4Wl	4Wm	4Wu[1]	4Xm	4Xn	4Xo	4Xp	4Xq	4Xr	4Xs	4Xu[1]
1977	2 675	0	11 486	0	38 565	0	1	0	0	0	0	0	968
1978	5	210	705		159 776		656		113				3 622
1979			20 956		136 743		3						1 803
1980	20 634	75	81 757		7 705		3 237	73	11				31
1981	8 838	131	8 441	5		25	90		9				
1982	887	17	3 564				902						
1983	891	45	1 431				217	100					
1984	135 275	128	7 775		35	5	753						
1985	138 995	40	117 388		50		12		1				
1986	124 301	35	127 956		10 833	1	530						
1987	43 358	5	4 257				5			8			
1988	492 266	2 972	329 122			50	45 491		7				
1989	93 490		376 720			90	4 307		10				
1990	2 305 273	6 383	908 067	1 100	7 200	3	161 624	405	43	1			
1991	168 795	157	272 393				26 512	61	31				
1992	660 811	1	674 960		20		52 623		35 001	2	15		
1993	543 315	111	46 649			38	11 266	18	59	1	2		300
1994	3 219	84	37 746			148	791	237	9				
1995	15 264	29	39 187		21	30	1 297	27	562	92	4	2	
1996	25 215	982	54 667		1	6	1 149	13	1	10			
1997	46 061	97	60 543			3	912	4	2	18			
1998	34	125	6 881				23	3	21	5		3	
1999	291	1	13 018				7	7	4	5			
2000	16	34	26		1	23	29	4	5	30	3		110
2001	5	10	2 914			2	55	48	4	14	1	2 200	
2002	126	7	1 196		1	29	3 441	102	22	14 853	4	43	
2003	151	67	5 980			1	44	82	6	3 016	24	3	
2004	8 083	317	2 654			16	14	283		290	26		
2005			26			8	1	3	16	94	1		
2006	3 722	840	846	0	1	216	0	3	3	15 945	2	0	1
2007	848	1	342			208	51	11	11	43	7	8	
2008		1	6			6	3	58	4	9	1		
2009		10	2			8		52	3	200	2		
2010		189	14			8	6	4	105	76	10	4	
2011		89	66		3 000	3	20	4	7	266	119		
NK[2]			45										
TOTAL	**4 842 844**	**13 193**	**3 219 786**	**1 105**	**363 952**	**927**	**316 072**	**1 602**	**36 070**	**34 978**	**221**	**2 263**	**6 835**

[1] "u" = non déterminé / "u" = *unknown*

[2] Année non déterminée / *Year unknown*

Table 12. (Continued).

ANNÉE /	DIVISION, SOUS-DIVISION, ZONE UNITAIRE / *DIVISION, SUBDIVISION, UNIT AREA*									
YEAR	5Yb	5Yf	5Yu[1]	5Zj	5Zm	2	3	4	5	TOTAL
1977						0	0	53 696	0	**53 696**
1978				597	434	0	1	168 541	1 031	**169 573**
1979						0	0	159 512	0	**159 512**
1980				15		0	0	116 216	15	**116 231**
1981				2		0	0	18 005	2	**18 007**
1982				11		20	0	6 001	11	**6 032**
1983				58	1	0	0	6 182	59	**6 241**
1984						0	10	317 684	0	**317 694**
1985				16		0	0	427 140	16	**427 156**
1986						0	0	284 472	0	**284 472**
1987				2		0	0	47 657	2	**47 659**
1988						0	0	906 889	0	**906 889**
1989					4	0	0	479 748	4	**479 752**
1990				25	1	0	0	3 635 941	26	**3 635 967**
1991				1 757	2	0	0	1 058 247	1 759	**1 060 006**
1992				36		0	0	2 284 107	36	**2 284 143**
1993			20	13	1	0	14	651 074	34	**651 122**
1994				1 102	2	0	0	42 594	1 104	**43 698**
1995				8		0	0	59 294	8	**59 302**
1996				3		0	0	83 292	3	**83 295**
1997	1					0	0	109 338	1	**109 339**
1998						0	0	7 106	0	**7 106**
1999				1	1	0	0	13 392	2	**13 394**
2000		5		269	70	0	0	286	344	**630**
2001				8	3	0	0	6 254	11	**6 265**
2002	2			7	2	0	0	19 825	11	**19 836**
2003	1			3		0	0	9 448	4	**9 452**
2004				3	8	0	0	13 045	11	**13 056**
2005	10			10	2	0	0	169	22	**191**
2006						0	0	39 319	0	**39 319**
2007				6		0	0	1 640	6	**1 646**
2008						0	0	116	0	**116**
2009	1					0	0	282	1	**283**
2010	12	1		2		1	0	459	15	**475**
2011	7				1	0	0	3 579	8	**3 587**
NK[2]						0	0	45	0	**45**
TOTAL	**34**	**6**	**20**	**3 954**	**532**	**21**	**25**	**11 030 595**	**4 546**	**11 035 187**

[1] "u" = non déterminé / "u" = *unknown*

[2] Année non déterminée / *Year unknown*

Table 13. *Annual catches (kg) of Atlantic mackerel by fishing gear from the data of the Nova Scotia Observer Program since 1977.*

ANNÉE /	**ENGIN / *GEAR*[1]**										**TOTAL**
YEAR	**OST**	**OTB1**	**OTB2**	**OTM2**	**PTM**	**PS**	**GNS**	**LG**	**LHM**	**Autre / *Other***	
1977			50 415	3 281							**53 696**
1978			151 013	18 488				72			**169 573**
1979			159 092	355				65			**159 512**
1980		129	115 966	136							**116 231**
1981		77	17 880	50							**18 007**
1982	1	0	6 029	2							**6 032**
1983		10	6 221	10							**6 241**
1984		106	317 588								**317 694**
1985			427 156								**427 156**
1986			284 472								**284 472**
1987			47 659								**47 659**
1988			715 629	191 260							**906 889**
1989			425 163	54 589							**479 752**
1990		1	1 499 758	2 136 207					1		**3 635 967**
1991		5	214 745	843 503		1 750			3		**1 060 006**
1992			636 580	1 612 562		35 000	1				**2 284 143**
1993			651 071	29	20	2					**651 122**
1994	32	231	42 335			1 100					**43 698**
1995			58 800			502					**59 302**
1996		11	83 098			185		1			**83 295**
1997			109 209			120		10			**109 339**
1998			6 946			160					**7 106**
1999			13 394								**13 394**
2000			208	312		110					**630**
2001			3 056	8		3 200		1			**6 265**
2002	5		5 055			14 775		1			**19 836**
2003	101		6 347			3 000		1		3	**9 452**
2004			12 056			1 000					**13 056**
2005			103			75	12			1	**191**
2006			5 266	18 039		15 930	4			80	**39 319**
2007			731	915							**1 646**
2008			115				1				**116**
2009			263			10	5	4		1	**283**
2010	1		469							5	**475**
2011	2		331			3 254					**3 587**
NK[2]			45								**45**
TOTAL	**142**	**570**	**6 074 264**	**4 879 746**	**20**	**80 173**	**23**	**155**	**4**	**90**	

[1] OST= Chalut à crevette / *Otter shrimp trawl* ; OTB1= Chalut de fond (côté) / *Bottom otter trawl (side)* ; OTB2= Chalut de fond (arrière) / *Bottom otter trawl (stern)* ; OTM2= Chalut pélagique (arrière) / *Midwater trawl (stern)* ; PTM= Chalut bœuf pélagique / *Midwater paired trawl* ; PS= Senne bourse / *Purse seine* ; GNS= Filet maillant fixe / *Set gillnet* ; LG= Palangre / *Longline* ; LHM= Turlutte / *Jigger*

[2] Année non déterminée / *Year unknown*

Table 14. *Annual catches (kg) of Atlantic mackerel by main species sought for the foreign vessels covered by the Nova Scotia Observer Program since 1977.*

ANNÉE /	CODE DES PRINCIPALES ESPÈCES VISÉES / *CODE OF THE MAIN SPECIES SOUGHT*[1]																									TOTAL
YEAR	10	11	12	13	14	16	23	30	42	43	49	60	70	71	211	220	400	2211	2550	4511	7001	7099	6600	7011	NK[2]	
1977					263															11 391		21 873			20 169	53 696
1978					88 809															51 386		24 838				165 033
1979					145 031															2 213		12 216				159 460
1980					108 226															142		6 068				114 436
1981					16 350															80		775				17 205
1982					4 467															600		24				5 091
1983					1 969															5		10				1 984
1984	5				316 161																	885				317 051
1985	2				425 874																	68				425 944
1986					283 717																	280				283 997
1987					47 615																					47 615
1988					697 158							55	155 185							1 035		45 727				899 160
1989					402 562								54 539							2 885		13 386				473 372
1990					923 465		5						2 536 941							563		173 810				3 634 784
1991					204 462								851 495							2		788				1 056 747
1992					628 664	180							1 612 552									283				2 241 679
1993					630 929								11 390							647		7 083				650 049
1994					38 830															2 847		7				41 684
1995					58 075	35														79		70				58 259
1996				1	81 504										5			1								81 511
1997					108 999															41		5				109 045
1998					6 813															92						6 905
1999			900	5	12 444															25						13 374
2000					66																					66
2001					2 916																					2 916
2002					1 193																					1 193
2003					6 117																					6 117
2004					10 736																					10 736
2005																										0
2006																										0
2007																										0
2008																										0
2009																										0
2010																										0
2011																										0
TOTAL	7	0	900	6	5 253 415	215	5	0	0	0	0	55	5 222 102	0	5	0	0	1	0	74 033	0	308 196	0	0	20 169	

[1] Voir annexe 1 / *See appendix 1*

[2] Espèce visée non indiquée / *Species sought not indicated*

Table 15. *Annual catches (kg) of Atlantic mackerel by main species sought for the Canadian vessels covered by the Nova Scotia Observer Program since 1977.*

ANNÉE /	CODE DES PRINCIPALES ESPÈCES VISÉES / *CODE OF THE MAIN SPECIES SOUGHT*[1]																								TOTAL
YEAR	10	11	12	13	14	16	23	30	42	43	49	60	70	71	211	220	400	2211	2550	4511	7001	7099	6600	7011	NK[2]	
1977																										0
1978	660	3 038				334																508			0	4 540
1979	7					45																			0	52
1980	11	1 557				15	85															128			0	1 796
1981	76	132				153	227		51													163			0	802
1982	227	438				185	20															71			0	941
1983	126	796				2 700	85															550			0	4 257
1984	138	152				109	112	5														127			0	643
1985	84	765				60	13		20													270			0	1 212
1986		67				50																358			0	475
1987	4					32																8			0	44
1988	42				299	4 356	11															3 021			0	7 729
1989	3 047				7	3 208																118			0	6 380
1990	694	150				311			10													18			0	1 183
1991	1 165	3			30	280						1 750										31			0	3 259
1992	330				80	5 543	6						35 000									1 505			0	42 464
1993	15	4			332	416	193		1			2	20									90			0	1 073
1994	9				40	63	423		2			1 100										377			0	2 014
1995		8			203	67	122					502										141			0	1 043
1996		2			1 389	42	128					45				5					1	172			0	1 784
1997	3	7			5	43	23					120					2					91			0	294
1998		2				7	14					160										18			0	201
1999		1			4	1	1										1					12			0	20
2000		29			38		37					422										38			0	564
2001	1	8			62		4		3			3 208									63				0	3 349
2002		7			384		3 279		2			14 755									196				20	18 643
2003	1	2			84		17			1		3 000							3		227				0	3 335
2004	3	10			710				2			1 000									595				0	2 320
2005	12	12			53		3					75									35		1		0	191
2006		2			5 241		2					22 106	11 863	80							25				0	39 319
2007		53			561		86					915									31					1 646
2008					39		5			1											70				1	116
2009	4				5		3					10							6		253				2	283
2010	2	8			213	3	199			1								1	3		44				1	475
2011		7			75	9	95					3 254						2			38				107	3 587
TOTAL	6 660	7 261	0	0	9 854	18 032	5 193	5	91	3	0	52 424	46 883	80	0	5	3	3	12	0	1 578	7 815	1	0	131	

[1] Voir annexe 1 / *See appendix 1*

[2] Espèce visée non indiquée / *Species sought not indicated*

Table 16. Commercial catch ('000), length (cm) and weight (kg) at age of Atlantic mackerel in NAFO Subareas 3-4 in 2011[1].

ÂGE /	**MOYENNE /** ***AVERAGE***		**NOMBRE CAPTURÉ /** ***CATCH NUMBER*** **('000)**		
AGE	**POIDS /** ***WEIGHT*** **(kg)**	**LONGUEUR /** ***LENGTH*** **(cm)**	**MOYENNE /** ***AVERAGE***	**ERREUR-TYPE /** ***STD. ERROR***	**C.V.**
1	0.188	26.3	1 715	72.41	0.04
2	0.293	29.7	922	102.78	0.11
3	0.428	33.5	8 702	407.59	0.05
4	0.491	34.9	4 565	434.00	0.10
5	0.565	36.4	479	128.55	0.27
6	0.574	36.6	2 323	305.75	0.13
7	0.704	38.9	252	84.85	0.34
8	0.649	37.9	355	98.67	0.28
9	0.650	38.0	19	19.17	1.01
10					
11					
12	0.710	39.0	30	29.95	1.01

[1] Débarquements totaux / *Total landings* = 8 544 t

Table 17. Commercial catch at age[1] in number ('000) of Atlantic mackerel in NAFO Subareas 3 and 4 since 1968.

ÂGE /	**ANNÉE / *YEAR***																		
AGE	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**
1	**43062**	5692	20277	7156	1	9176	8618	**14206**	1686	740	2	204	6	6145	2145	**244**	60	357	363
2	7157	**26359**	3654	7389	136	20624	24340	24905	**21171**	7136	182	480	1455	2836	5899	1622	**19774**	511	4282
3	10343	18057	**33584**	1702	4401	9649	26703	13049	27110	**22566**	3831	1189	2156	5143	1609	2459	14060	**23790**	3259
4	7393	2027	8047	**35931**	5541	9333	14602	11636	10982	11319	**14733**	6615	1463	1183	5004	915	1413	12844	**40844**
5	2819	929	2496	7620	**24826**	13972	12594	7052	7740	3683	11575	**17202**	5087	1656	715	4012	781	1252	11522
6	1349	855	451	1753	4975	**22293**	12417	7526	3868	2570	6358	12321	**9833**	4669	1609	478	1551	656	933
7	721	1099	425	2203	5248	8317	**15377**	5456	4922	809	3157	5590	6148	**7743**	2623	946	339	2197	485
8	1658	440	1578	1526	77	2771	4053	**3917**	3977	1443	1649	2282	2692	3309	**4828**	3119	479	289	635
9	10425	462	1645	1879	546	837	1714	825	**3123**	897	1402	1702	1604	1595	1549	**7770**	2022	551	117
10+	97	9656	4335	5517	6833	1603	1749	581	1165	**1721**	2497	2457	1998	1892	2504	3601	**5640**	7605	1915

ÂGE /	**ANNÉE / *YEAR***																		
AGE	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
1	1291	117	**2399**	390	646	628	117	672	10603	2505	**5083**	1927	1348	**28460**	8215	6088	3763	**27524**	17391
2	3118	703	8862	**6222**	6106	2627	4900	231	14206	8050	11823	**18525**	4463	2689	**60111**	3832	4381	24574	**42971**
3	3358	1028	1276	9737	**17808**	3014	8493	3896	698	7052	10923	9977	**14625**	1800	11234	**70334**	5832	6017	24381
4	2288	1932	937	1457	9560	**14148**	4497	5905	4674	1013	4604	9560	7509	**5465**	2482	6047	**73840**	4753	4007
5	**27133**	2481	1541	888	1212	8630	**13011**	2856	4093	5380	638	4291	4698	2869	**4184**	2275	8480	**56010**	3807
6	5692	**24769**	575	966	762	1411	7686	**13672**	1768	6519	3709	505	2049	2941	842	**2136**	1123	2457	**40391**
7	232	4493	**20957**	639	1052	733	1660	5977	**5757**	1622	3081	2432	478	458	870	538	**1199**	1322	1680
8	183	227	2693	**16765**	849	1048	651	929	2281	**7094**	545	2024	681	65	144	407	32	**606**	746
9	83	131	369	923	**10964**	884	699	244	203	1806	**4212**	412	663	195	33	48	5	9	**81**
10+	716	572	781	277	557	**11142**	6882	2925	590	893	785	**1472**	354	371	371	73	0	0	45

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

Table 17. (Continued).

ÂGE /	**ANNÉE** / ***YEAR***																		
AGE	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
1	**31651**	2968	23622	**38026**	5402	1715													
2	14756	**31233**	8120	24443	**31923**	922													
3	**41630**	22784	**25964**	6613	28384	**8702**													
4	21769	**43885**	8655	**28416**	3829	4565													
5	3765	11105	**12703**	6363	**13988**	479													
6	1917	2471	1631	**9425**	2033	**2323**													
7	**17117**	1328	633	358	**3286**	252													
8	448	**4819**	218	127	83	**355**													
9	36	39	**1033**	5	0	19													
10+	0	7	9	**482**	132	30													

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

Table 18. Commercial catch at age[1] (%) of Atlantic mackerel in NAFO subareas 3 and 4 since 1968.

ÂGE /	ANNÉE / *YEAR*																		
AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	**50.65**	8.68	26.51	9.85	0.00	9.31	7.05	**15.93**	1.97	1.40	0.00	0.41	0.02	16.99	7.53	**0.97**	0.13	0.71	0.56
2	8.42	**40.20**	4.78	10.17	0.26	20.92	19.92	27.93	**24.69**	13.49	0.40	0.96	4.48	7.84	20.71	6.45	**42.88**	1.02	6.65
3	12.16	27.54	**43.91**	2.34	8.37	9.79	21.86	14.64	31.62	**42.67**	8.44	2.38	6.65	14.22	5.65	9.77	30.49	**47.53**	5.06
4	8.69	3.09	10.52	**49.44**	10.54	9.47	11.95	13.05	12.81	21.40	**32.46**	13.22	4.51	3.27	17.57	3.64	3.06	25.66	**63.47**
5	3.32	1.42	3.26	10.48	**47.21**	14.17	10.31	7.91	9.03	6.96	25.50	**34.38**	15.68	4.58	2.51	15.94	1.69	2.50	17.90
6	1.59	1.30	0.59	2.41	9.46	**22.61**	10.16	8.44	4.51	4.86	14.01	24.62	**30.31**	12.91	5.65	1.90	3.36	1.31	1.45
7	0.85	1.68	0.56	3.03	9.98	8.44	**12.59**	6.12	5.74	1.53	6.96	11.17	18.95	**21.41**	9.21	3.76	0.74	4.39	0.75
8	1.95	0.67	2.06	2.10	0.15	2.81	3.32	**4.39**	4.64	2.73	3.63	4.56	8.30	9.15	**16.95**	12.39	1.04	0.58	0.99
9	12.26	0.71	2.15	2.59	1.04	0.85	1.40	0.92	**3.64**	1.70	3.09	3.40	4.94	4.41	5.44	**30.87**	4.38	1.10	0.18
10+	0.11	14.72	5.67	7.59	12.99	1.63	1.43	0.65	1.36	**3.26**	5.50	4.91	6.16	5.23	8.79	14.31	**12.23**	15.19	2.98

ÂGE /	ANNÉE / *YEAR*																		
AGE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
1	2.93	0.32	**5.94**	1.02	1.30	1.42	0.24	1.80	23.63	5.97	**11.20**	3.77	3.66	**62.81**	9.28	6.63	3.81	**22.33**	12.83
2	7.07	1.93	21.94	**16.26**	12.33	5.93	10.08	0.62	31.66	19.20	26.04	**36.23**	12.11	5.93	**67.93**	4.18	4.44	19.93	**31.71**
3	7.62	2.82	3.16	25.45	**35.96**	6.81	17.48	10.44	1.56	16.82	24.06	19.51	**39.67**	3.97	12.70	**76.63**	5.91	4.88	17.99
4	5.19	5.30	2.32	3.81	19.31	**31.96**	9.25	15.83	10.42	2.42	10.14	18.70	20.37	**12.06**	2.80	6.59	**74.85**	3.86	2.96
5	**61.54**	6.81	3.81	2.32	2.45	19.50	**26.77**	7.66	9.12	12.83	1.41	8.39	12.74	6.33	**4.73**	2.48	8.60	**45.44**	2.81
6	12.91	**67.94**	1.42	2.52	1.54	3.19	15.82	**36.65**	[illegible].94	15.55	8.17	0.99	5.56	6.49	0.95	**2.33**	1.14	1.99	**29.81**
7	0.53	12.32	**51.89**	1.67	2.12	1.66	3.42	16.02	**12.83**	3.87	6.79	4.76	1.30	1.01	0.98	0.59	**1.21**	1.07	1.24
8	0.42	0.62	6.67	**43.81**	1.71	2.37	1.34	2.49	5.08	**16.92**	1.20	3.96	1.85	0.14	0.16	0.44	0.03	**0.49**	0.55
9	0.19	0.36	0.91	2.41	**22.14**	2.00	1.44	0.65	0.45	4.31	**9.28**	0.81	1.80	0.43	0.04	0.05	0.01	0.01	**0.06**
10+	1.62	1.57	1.93	0.72	1.12	**25.17**	14.16	7.84	1.31	2.13	1.73	**2.88**	0.96	0.82	0.42	0.08	0.00	0.00	0.03

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

Table 18. (Continued).

ÂGE / *AGE*	ANNÉE / *YEAR*																		
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	**23.78**	2.46	28.60	**33.28**	6.07	8.86													
2	11.09	**25.89**	9.83	21.39	**35.84**	4.76													
3	**31.28**	18.89	**31.44**	5.79	31.87	**44.94**													
4	16.36	**36.38**	10.48	**24.87**	4.30	23.58													
5	2.83	9.21	**15.38**	5.57	**15.71**	2.47													
6	1.44	2.05	1.97	**8.25**	2.28	**12.00**													
7	**12.86**	1.10	0.77	0.31	**3.69**	1.30													
8	0.34	**3.99**	0.26	0.11	0.09	**1.83**													
9	0.03	0.03	**1.25**	0.00	0.00	0.10													
10+	0.00	0.01	0.01	**0.42**	0.15	0.15													

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

Table 19. Commercial weight (kg) at age[1] of Atlantic mackerel in NAFO subareas 3 and 4 since 1968.

ÂGE /	ANNÉE / *YEAR*																		
AGE	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	**0.148**	0.131	0.107	0.110	0.123	0.113	0.111	**0.104**	0.097	0.114	0.192	0.190	0.146	0.114	0.152	**0.098**	0.098	0.203	0.163
2	0.241	**0.214**	0.179	0.181	0.210	0.189	0.190	0.176	**0.168**	0.198	0.285	0.272	0.376	0.315	0.340	0.257	**0.162**	0.393	0.306
3	0.335	0.300	**0.253**	0.256	0.300	0.269	0.273	0.252	0.244	**0.288**	0.425	0.531	0.548	0.523	0.541	0.479	0.338	**0.399**	0.435
4	0.425	0.382	0.324	**0.327**	0.386	0.345	0.352	0.326	0.316	0.375	**0.463**	0.567	0.609	0.577	0.606	0.593	0.525	0.505	**0.436**
5	0.506	0.456	0.389	0.391	**0.464**	0.414	0.425	0.393	0.382	0.454	0.509	**0.579**	0.617	0.643	0.666	0.628	0.625	0.601	0.520
6	0.576	0.520	0.444	0.446	0.533	**0.473**	0.487	0.451	0.440	0.524	0.582	0.603	**0.635**	0.660	0.743	0.659	0.657	0.742	0.671
7	0.634	0.574	0.491	0.494	0.590	0.524	**0.541**	0.500	0.489	0.582	0.625	0.652	0.672	**0.674**	0.737	0.712	0.696	0.767	0.784
8	0.683	0.618	0.530	0.532	0.638	0.565	0.585	**0.540**	0.530	0.631	0.659	0.714	0.705	0.707	**0.722**	0.709	0.715	0.779	0.800
9	0.722	0.654	0.562	0.564	0.677	0.600	0.621	0.573	**0.563**	0.671	0.673	0.752	0.781	0.723	0.719	**0.705**	0.705	0.840	0.856
10+	0.753	0.683	0.587	0.589	0.733	0.628	0.649	0.600	0.590	**0.703**	0.697	0.769	0.743	0.756	0.740	0.727	**0.709**	0.866	0.844

ÂGE /	ANNÉE / *YEAR*																		
AGE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
1	0.214	0.203	**0.169**	0.280	0.251	0.184	0.180	0.232	0.197	0.224	**0.240**	0.157	0.186	**0.208**	0.139	0.161	0.207	**0.212**	0.110
2	0.309	0.398	0.329	**0.331**	0.336	0.297	0.280	0.371	0.300	0.333	0.375	**0.273**	0.298	0.328	**0.280**	0.294	0.314	0.281	**0.306**
3	0.405	0.467	0.450	0.416	**0.435**	0.408	0.361	0.384	0.435	0.433	0.448	0.412	**0.439**	0.409	0.401	**0.389**	0.387	0.394	0.385
4	0.483	0.502	0.545	0.534	0.478	**0.449**	0.446	0.461	0.488	0.535	0.524	0.517	0.509	**0.488**	0.475	0.464	**0.490**	0.480	0.466
5	**0.506**	0.549	0.619	0.620	0.564	0.508	**0.489**	0.554	0.532	0.543	0.594	0.577	0.569	0.564	**0.562**	0.498	0.554	**0.554**	0.520
6	0.599	**0.579**	0.618	0.628	0.627	0.552	0.547	**0.549**	0.607	0.595	0.601	0.603	0.649	0.610	0.625	**0.607**	0.667	0.593	**0.618**
7	0.701	0.670	**0.660**	0.676	0.644	0.616	0.607	0.594	**0.616**	0.647	0.635	0.665	0.703	0.658	0.668	0.637	**0.726**	0.661	0.654
8	0.785	0.732	0.753	**0.678**	0.724	0.672	0.664	0.643	0.661	**0.684**	0.757	0.666	0.719	0.674	0.693	0.666	0.828	**0.754**	0.698
9	0.888	0.795	0.810	0.724	**0.712**	0.678	0.699	0.714	0.738	0.729	**0.700**	0.721	0.730	0.697	0.758	0.671	0.839	0.682	**0.708**
10+	0.892	0.876	0.884	0.863	0.816	**0.694**	0.724	0.714	0.799	0.845	0.751	**0.716**	0.769	0.704	0.775	0.696	0.680	0.680	0.665

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

Table 19. *(Continued).*

ÂGE / *AGE*	**ANNÉE /** *YEAR* 2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	**0.204**	0.206	0.175	**0.208**	0.148	0.188													
2	0.316	**0.308**	0.293	0.316	**0.348**	0.293													
3	**0.429**	0.427	**0.416**	0.416	0.431	**0.428**													
4	0.482	**0.503**	0.497	**0.495**	0.527	0.491													
5	0.544	0.582	**0.536**	0.580	**0.575**	0.565													
6	0.569	0.629	0.612	**0.605**	0.661	**0.574**													
7	**0.655**	0.665	0.644	0.675	**0.652**	0.704													
8	0.679	**0.711**	0.587	0.612	0.602	**0.649**													
9	0.667	0.767	**0.724**	0.707	0.716	0.650													
10+	0.679	0.692	0.733	**0.775**	0.667	0.710													

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

Table 20. Catch biomass (t) at age[1] of Atlantic mackerel in NAFO subareas 3 and 4 since 1968.

ÂGE /	**ANNÉE / *YEAR***																		
AGE	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**
1	**6373**	746	2170	787	0	1037	957	**1477**	164	84	0	39	1	701	326	**24**	6	72	59
2	1725	**5641**	654	1337	29	3898	4625	4383	**3557**	1413	52	131	547	893	2006	417	**3203**	201	1310
3	3465	5417	**8497**	436	1320	2596	7290	3288	6615	**6499**	1628	631	1181	2690	870	1178	4752	**9492**	1418
4	3142	774	2607	**11749**	2139	3220	5140	3793	3470	4244	**6821**	3751	891	683	3032	543	742	6486	**17808**
5	1426	424	971	2979	**11519**	5785	5352	2771	2957	1672	5892	**9960**	3139	1065	476	2520	488	752	5992
6	777	444	200	782	2651	**10545**	6047	3394	1702	1346	3700	7430	**6244**	3082	1195	315	1019	487	626
7	457	631	209	1088	3097	4358	**8319**	2728	2407	471	1973	3645	4131	**5219**	1933	674	236	1685	381
8	1132	272	836	812	49	1566	2371	**2115**	2108	910	1087	1629	1898	2339	**3486**	2211	342	225	508
9	7527	302	924	1060	370	502	1064	473	**1758**	602	944	1280	1253	1153	1114	**5478**	1426	463	100
10+	73	6595	2545	3249	5009	1007	1135	349	688	**1210**	1740	1889	1485	1430	1853	2618	**3999**	6583	1617

ÂGE /	**ANNÉE / *YEAR***																		
AGE	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
1	276	24	**405**	109	162	116	21	156	2089	561	**1220**	303	251	**5920**	1142	980	779	**5835**	1913
2	963	280	2916	**2059**	2052	780	1372	86	4262	2681	4434	**5057**	1330	882	**16831**	1127	1376	6905	**13149**
3	1360	480	574	4051	**7746**	1230	3066	1496	304	3054	4894	4111	**6420**	736	4505	**27360**	2257	2371	9387
4	1105	970	511	778	4570	**6352**	2006	2722	2281	542	2412	4943	3822	**2667**	1179	2806	**36182**	2282	1867
5	**13729**	1362	954	551	684	4384	**6362**	1582	2177	2921	379	2476	2673	1618	**2352**	1133	4698	**31029**	1980
6	3409	**14341**	356	607	478	779	4204	**7506**	1073	3879	2229	305	1330	1794	526	**1296**	749	1457	**24961**
7	162	3010	**13832**	432	677	452	1008	3550	**3546**	1049	1956	1617	336	301	581	343	**870**	874	1099
8	144	166	2028	**11367**	615	704	432	597	1508	**4852**	413	1348	490	44	100	271	27	**457**	521
9	74	104	299	668	**7806**	599	489	174	150	1317	**2948**	297	484	136	25	32	4	6	**57**
10+	639	501	690	239	454	**7734**	4986	2090	471	755	590	**1054**	272	261	287	51	0	0	30

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

Table 20. (Continued).

ÂGE /	ANNÉE / *YEAR*																		
AGE	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	**6457**	611	4134	**7909**	799	322													
2	4663	**9620**	2379	7724	**11109**	270													
3	**17859**	9729	**10801**	2751	12234	**3724**													
4	10493	**22074**	4302	**14066**	2018	2241													
5	2048	6463	**6809**	3691	**8043**	271													
6	1091	1554	998	**5702**	1344	**1333**													
7	**11212**	883	408	242	**2142**	177													
8	304	**3426**	128	78	50	**230**													
9	24	30	**748**	4	0	12													
10+	0	5	7	**374**	88	21													

[1] Les nombres en caractères gras et soulignés représentent des classes d'âge dominantes / *Bold and underlined numbers represent strong year-classes*

FIGURES

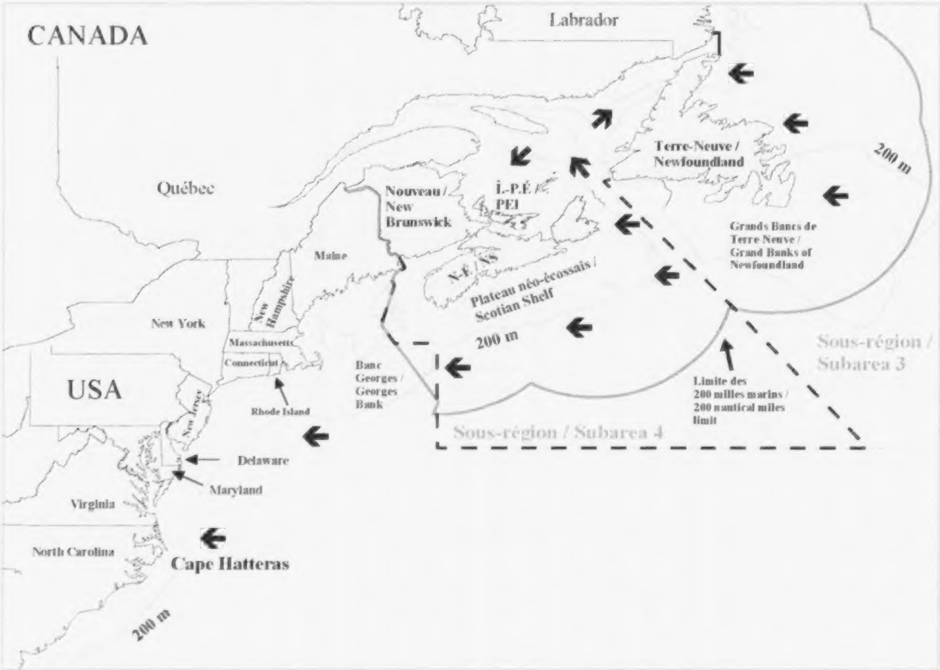

CANADA
Labrador
Québec
Terre-Neuve / Newfoundland
200 m
Nouveau / New Brunswick
Î.-P.É / PEI
Grands Bancs de Terre Neuve / Grand Banks of Newfoundland
Maine
N.-É. / NS
Plateau néo-écossais / Scotian Shelf
New Hampshire
New York
Massachusetts
Connecticut
200 m
Sous-région / Subarea 3
USA
Banc Georges / Georges Bank
Rhode Island
New Jersey
Limite des 200 milles marins / 200 nautical miles limit
Sous-région / Subarea 4
Delaware
Maryland
Virginia
North Carolina
Cape Hatteras
200 m

Figure 1. Presence and distribution (←) of Atlantic mackerel (Scomber scombrus L.) in the Northwest Atlantic. NAFO subareas 3 and 4 are indicated.

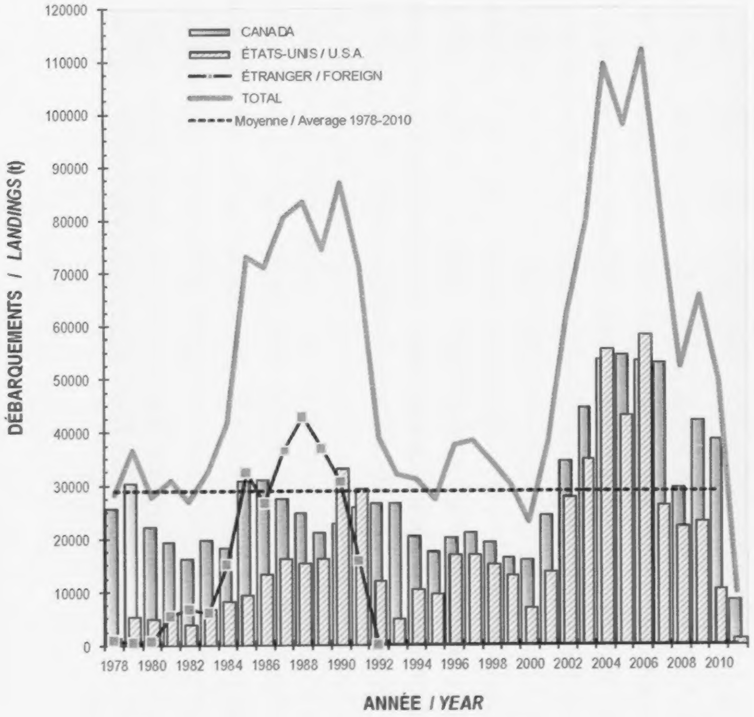


Figure 2. *Landings (t) of Atlantic mackerel since 1978 (first complete year under the 200 nautical mile Exclusive Economic Zone -EEZ-). The horizontal line represents the average of Canadian landings for the 1978-2010 period.*

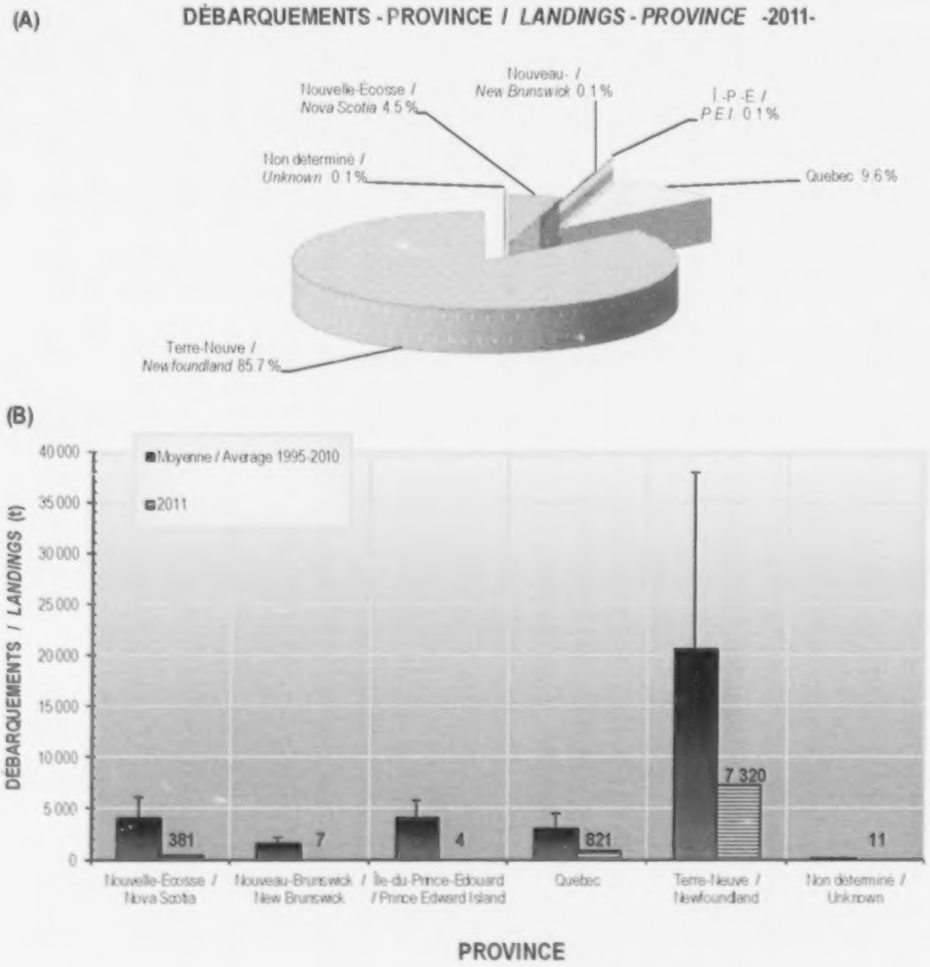


Figure 3. ***Atlantic mackerel landings (%) by province in 2011 (A) and annual averages (t) for the 1995-2010 period (B).***

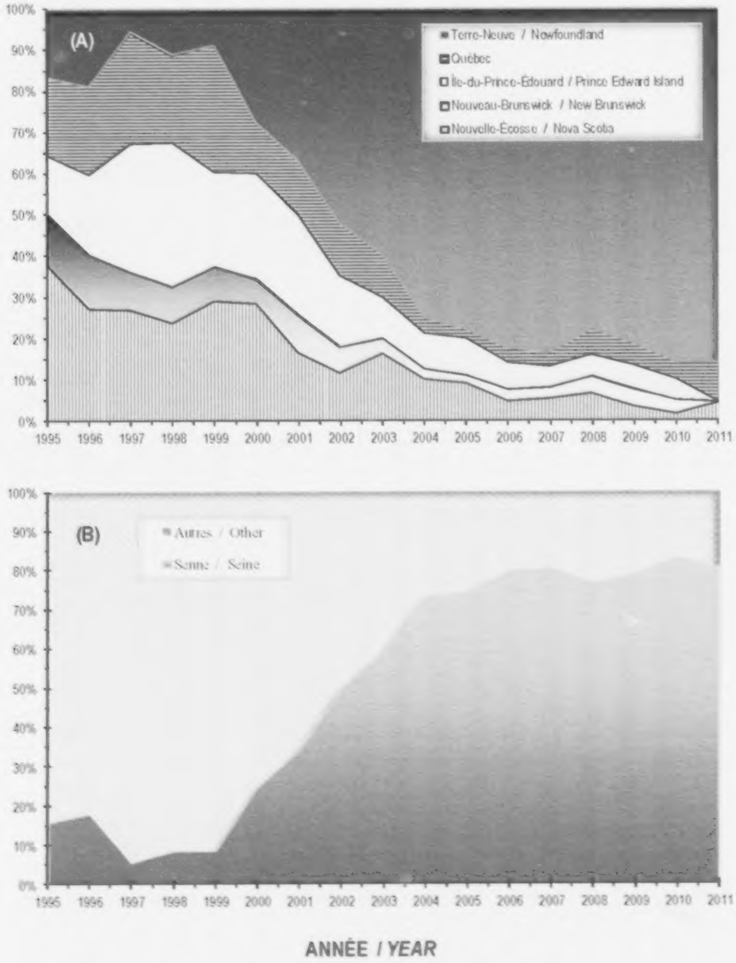


Figure 4. *Annual landings (%) of Atlantic mackerel by province (A) and annual percentages of the catches made by seines (purse, Tuck-Ring, and other) since 1995 (B).*

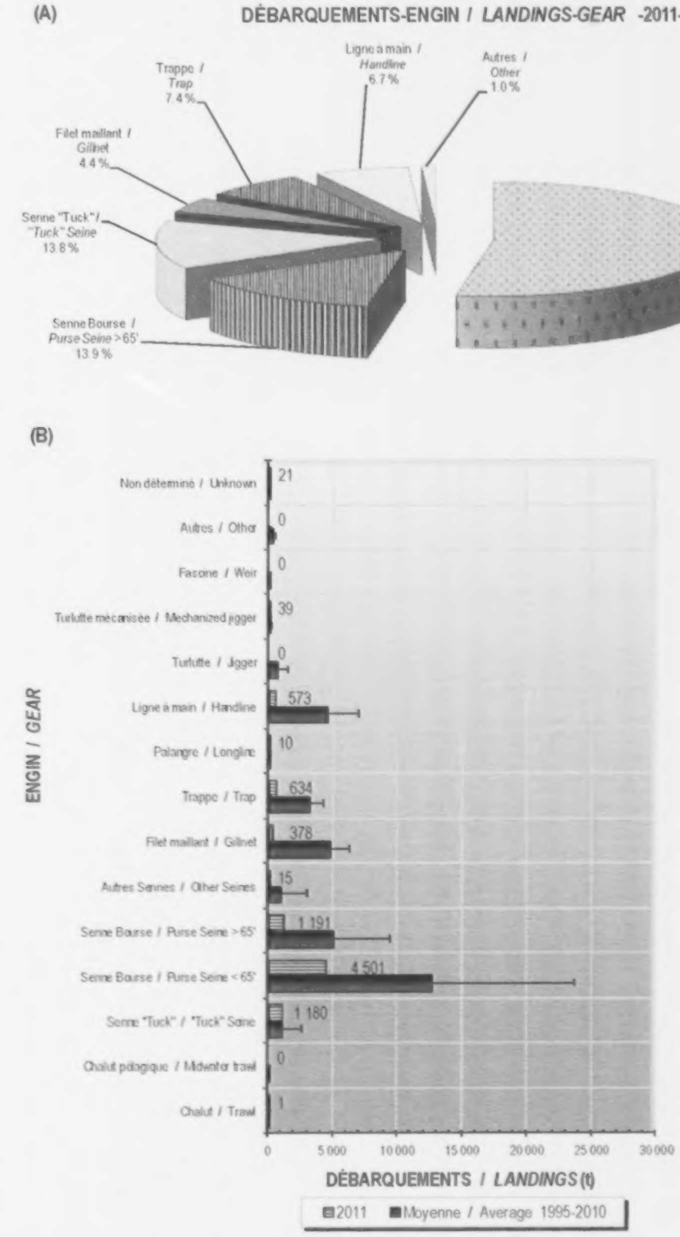


Figure 5. *Atlantic mackerel landings (%) by fishing gear in 2011 (A) and annual averages (t) for the 1995-2010 period (B).*

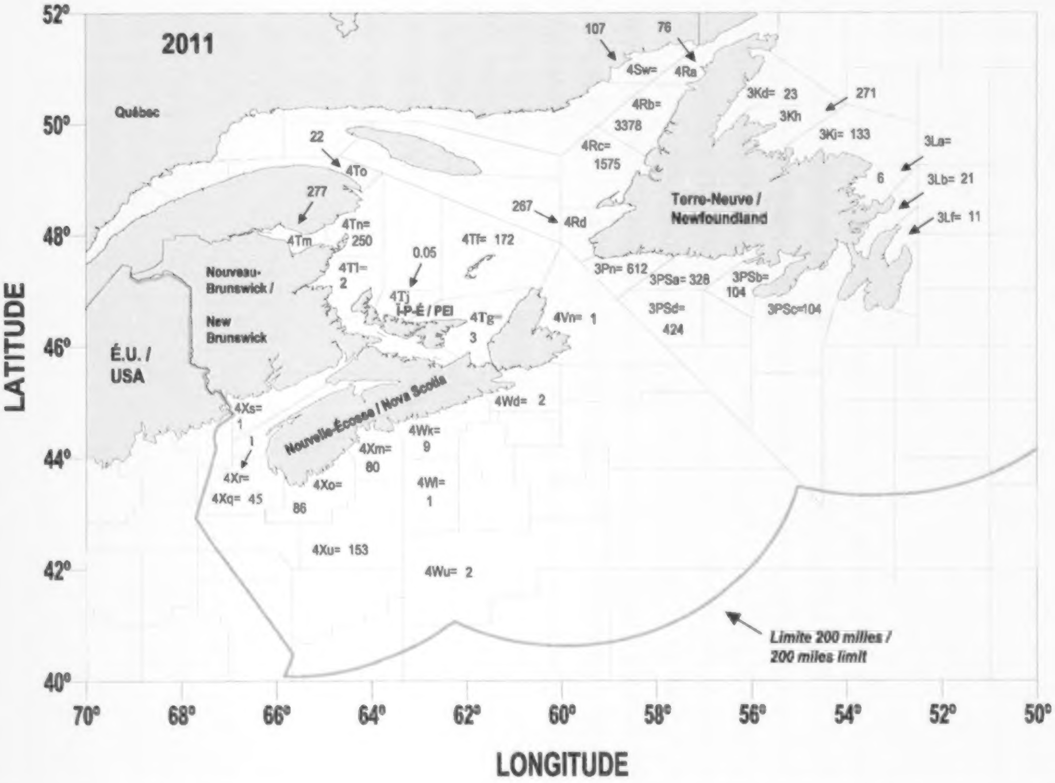

2011
Québec
107
76
4Sw=
4Ra
4Rb=
3378
4Rc=
1575
3Kd= 23
3Kh
271
3Ki= 133
3La=
6
3Lb= 21
3Lf= 11
22
4To
277
4Tm
4Tn=
250
267
4Rd
Terre-Neuve /
Newfoundland
4Tf= 172
0.05
4Tl=
2
4Tj
Î-P-É / PEI
4Tg=
3
4Vn= 1
3Pn= 612
3PSa= 328
3PSb=
104
3PSc=104
3PSd=
424
Nouveau-
Brunswick /
New
Brunswick
É.U. /
USA
Nouvelle-Écosse / Nova Scotia
4Xs=
1
1
4Xr=
4Xq= 45
4Xo=
86
4Xm=
80
4Wk=
9
4Wd= 2
4Wl=
1
4Xu= 153
4Wu= 2
Limite 200 milles /
200 miles limit
52°
50°
48°
46°
44°
42°
40°
LATITUDE
70°
68°
66°
64°
62°
60°
58°
56°
54°
52°
50°
LONGITUDE

Figure 6. Map of the Atlantic mackerel catches (t) in 2011 by NAFO subdivision and unit area (u= unknown unit area).

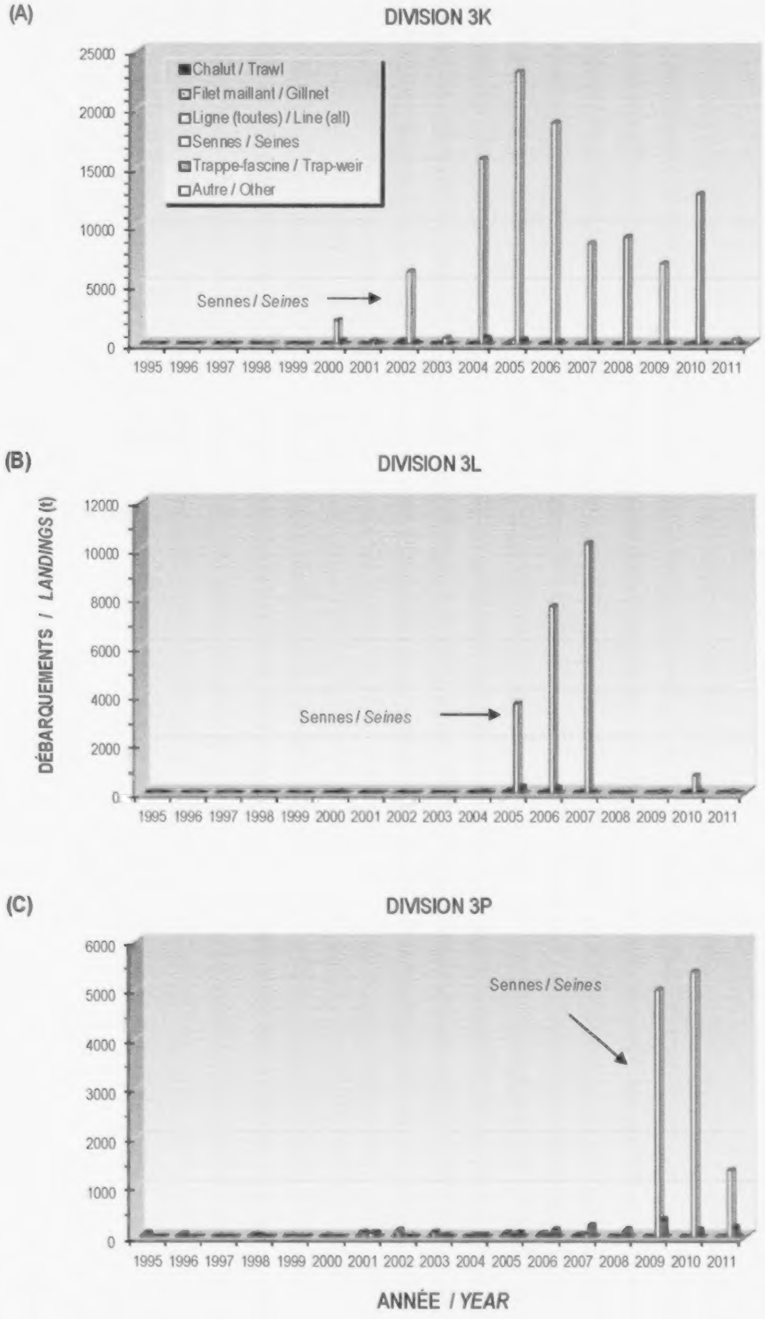


Figure 7. Atlantic mackerel landings (t) by NAFO Division and fishing gear since 1995 (the most important fishing gears are indicated).

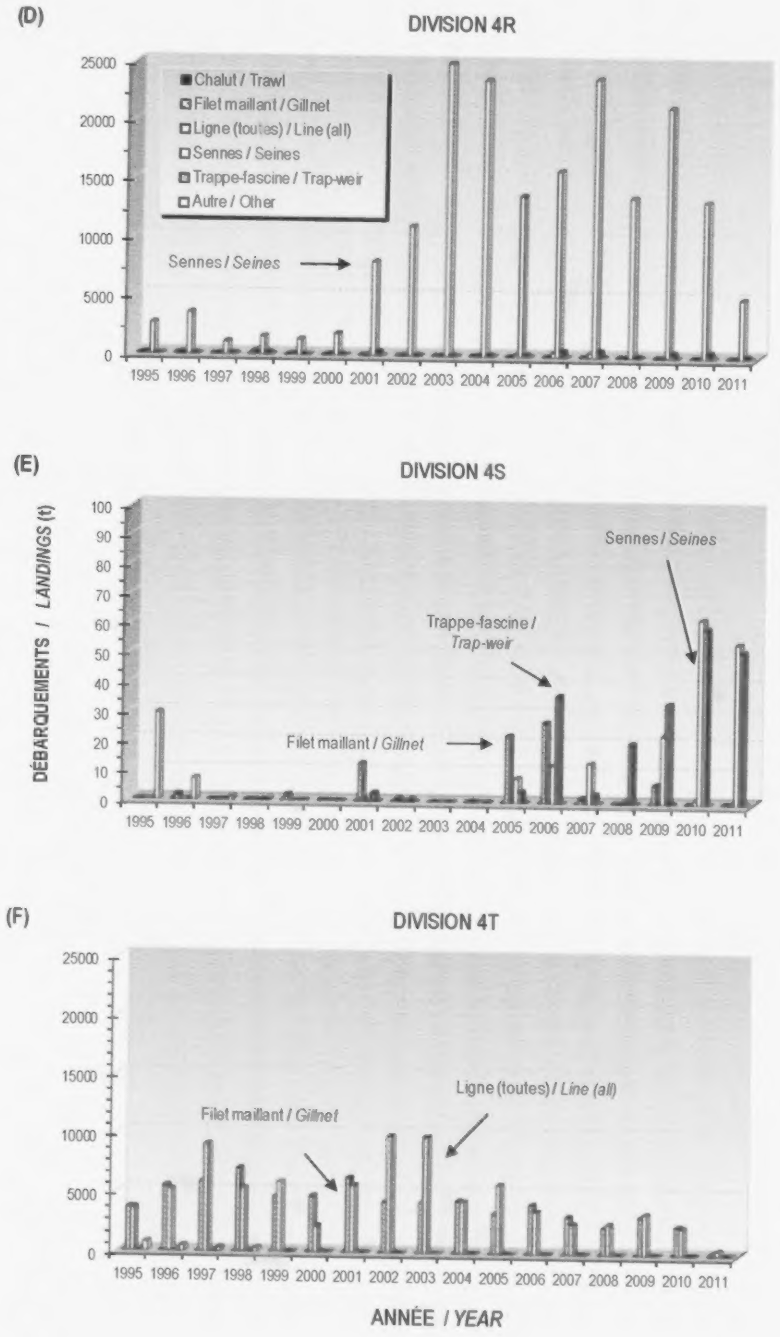


Figure 7. *(Continued).*

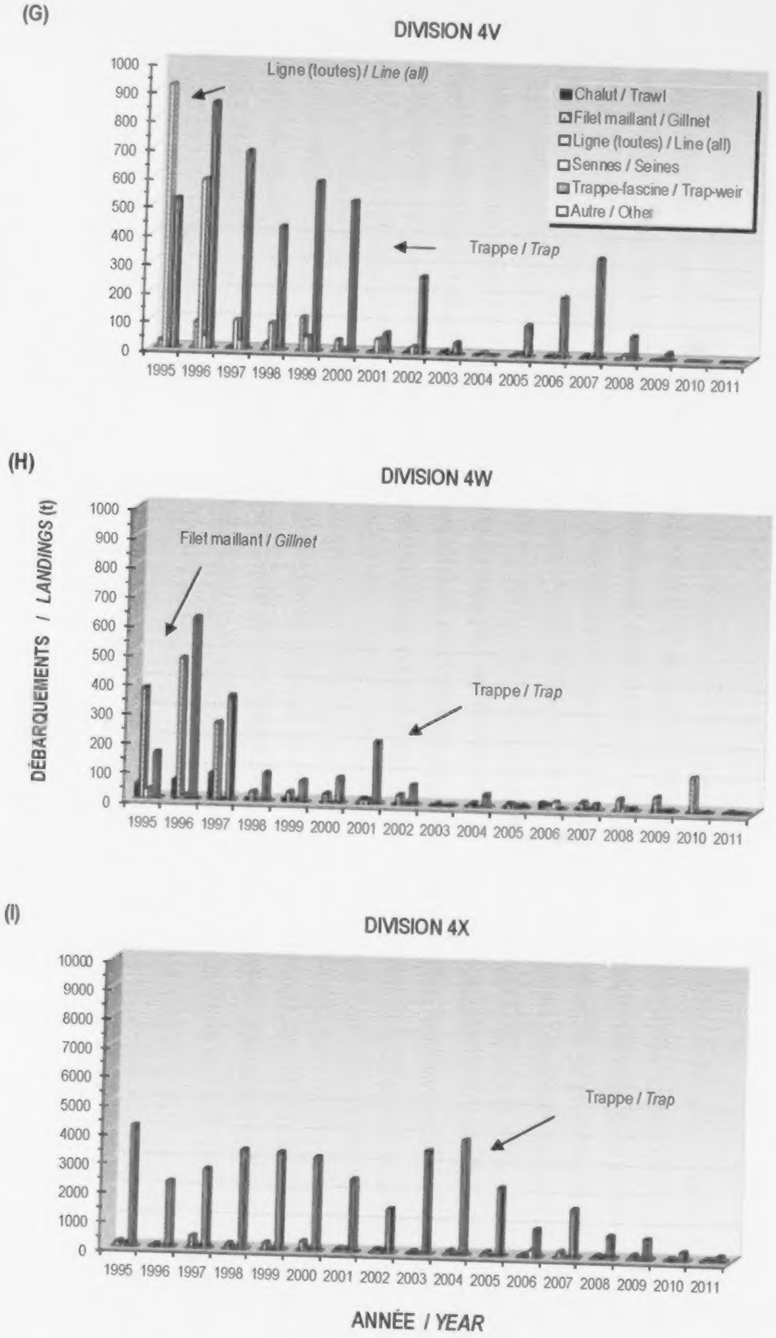


Figure 7. *(Continued).*

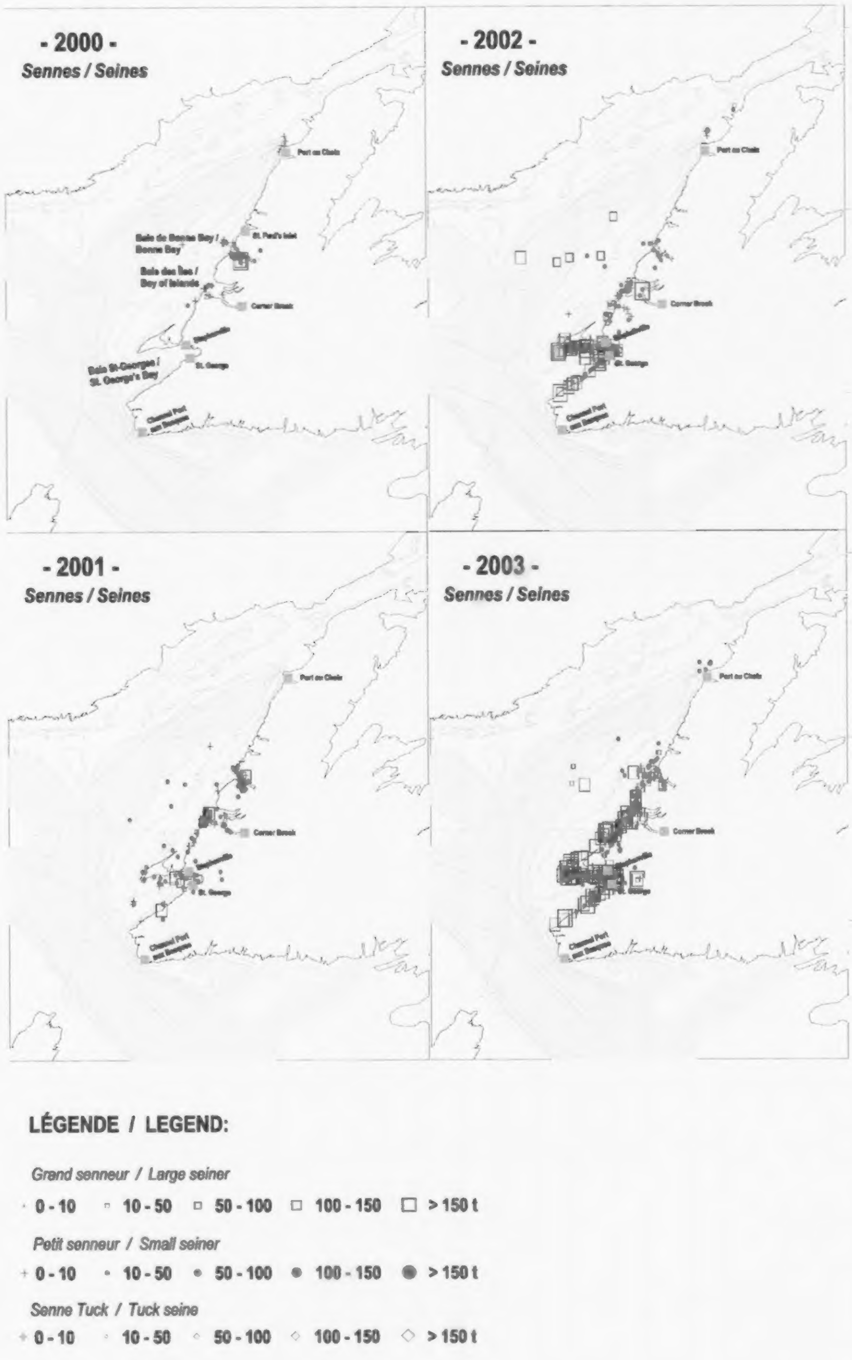

- 2000 -
Sennes / Seines
Port au Choix
Baie de Bonne Bay / Bonne Bay
St. Paul's Inlet
Baie des Îles / Bay of Islands
Corner Brook
Stephenville
Baie St-Georges / St. George's Bay
St. George
Chenal Port aux Basques
- 2002 -
Sennes / Seines
- 2001 -
Sennes / Seines
- 2003 -
Sennes / Seines
LÉGENDE / LEGEND:
Grand senneur / Large seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Petit senneur / Small seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Senne Tuck / Tuck seine
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t

Figure 8. Locations of the Atlantic mackerel annual catches (t) for the large and small seiners (2000-2011) and Tuck-Ring seine (2005-2011) of NAFO Division 4R.

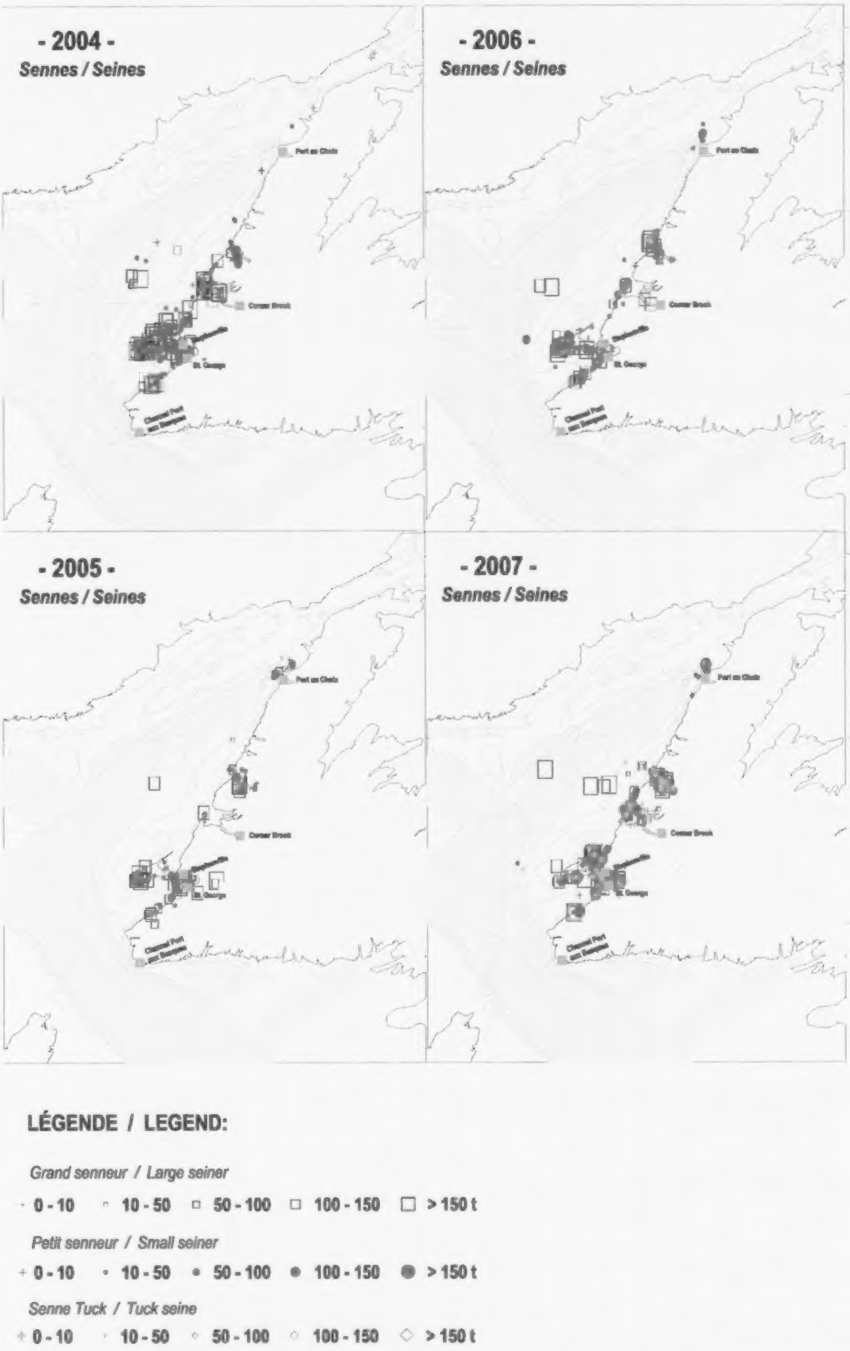

- 2004 -
Sennes / Seines
- 2006 -
Sennes / Seines
- 2005 -
Sennes / Seines
- 2007 -
Sennes / Seines
Port au Choix
Corner Brook
St. George
Channel Port aux Basques
LÉGENDE / LEGEND:
Grand senneur / Large seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Petit senneur / Small seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Senne Tuck / Tuck seine
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t

Figure 8. *(Continued).*

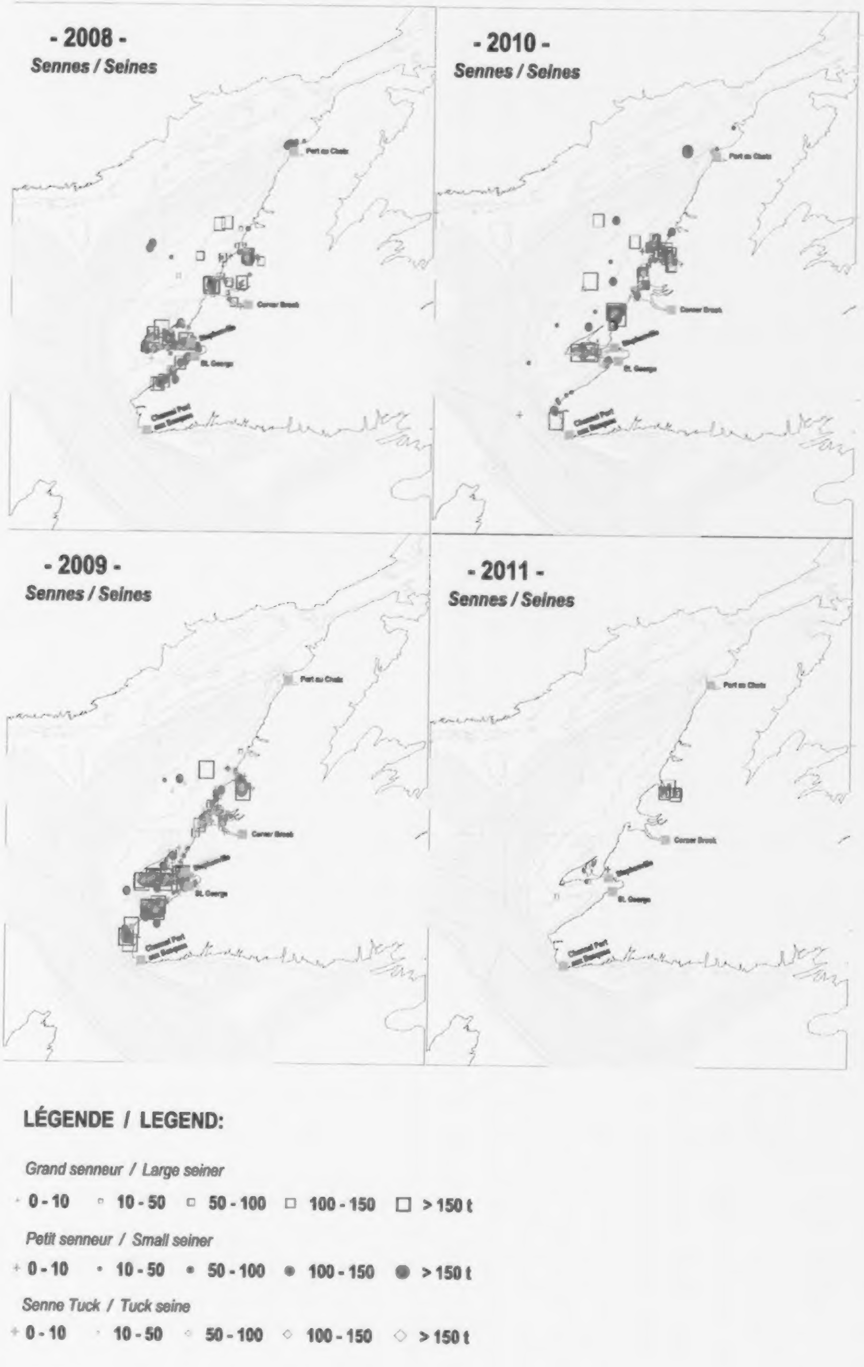
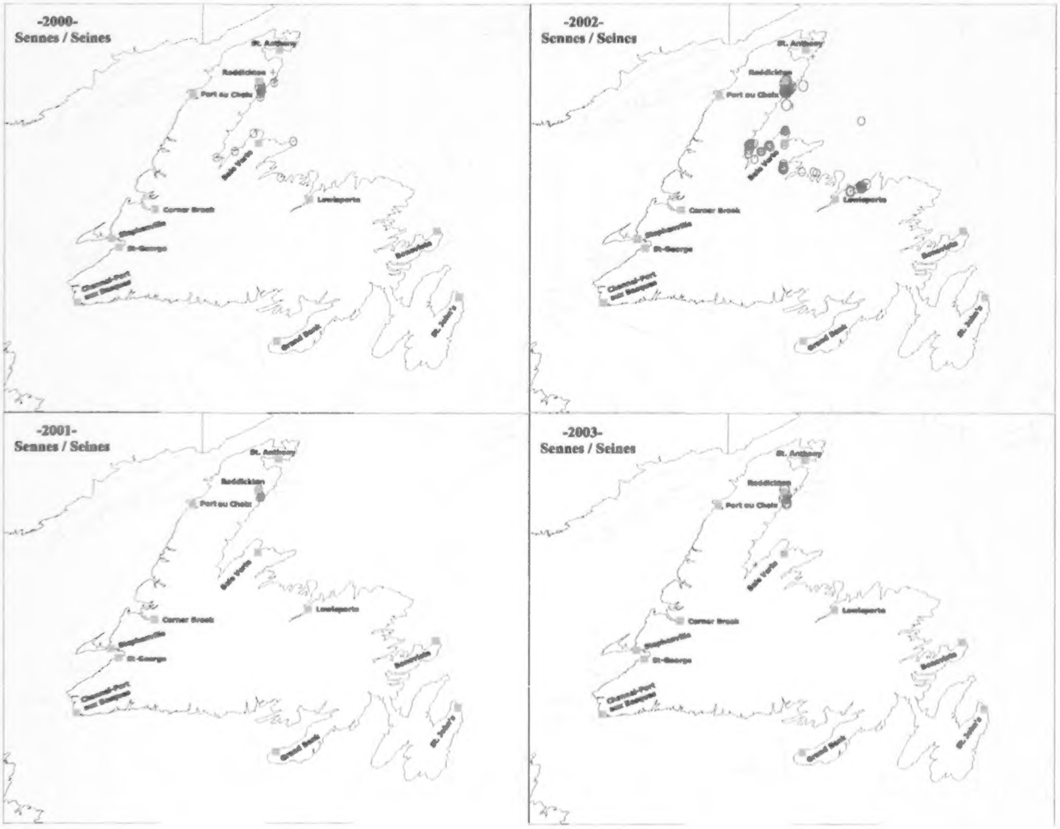

- 2008 -
Sennes / Seines
- 2010 -
Sennes / Seines
- 2009 -
Sennes / Seines
- 2011 -
Sennes / Seines
Port au Choix
Corner Brook
Stephenville
St. George
Chenal Port aux Basques
LÉGENDE / LEGEND:
Grand senneur / Large seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Petit senneur / Small seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Senne Tuck / Tuck seine
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t

Figure 8. (Continued).


-2000-
Sennes / Seines
-2002-
Sennes / Seines
-2001-
Sennes / Seines
-2003-
Sennes / Seines
St. Anthony
Roddickton
Port au Choix
Baie Verte
Lewisporte
Corner Brook
Stephenville
St-George
Channel-Port aux Basques
Bonavista
Grand Bank
St. John's

LÉGENDE / LEGEND:

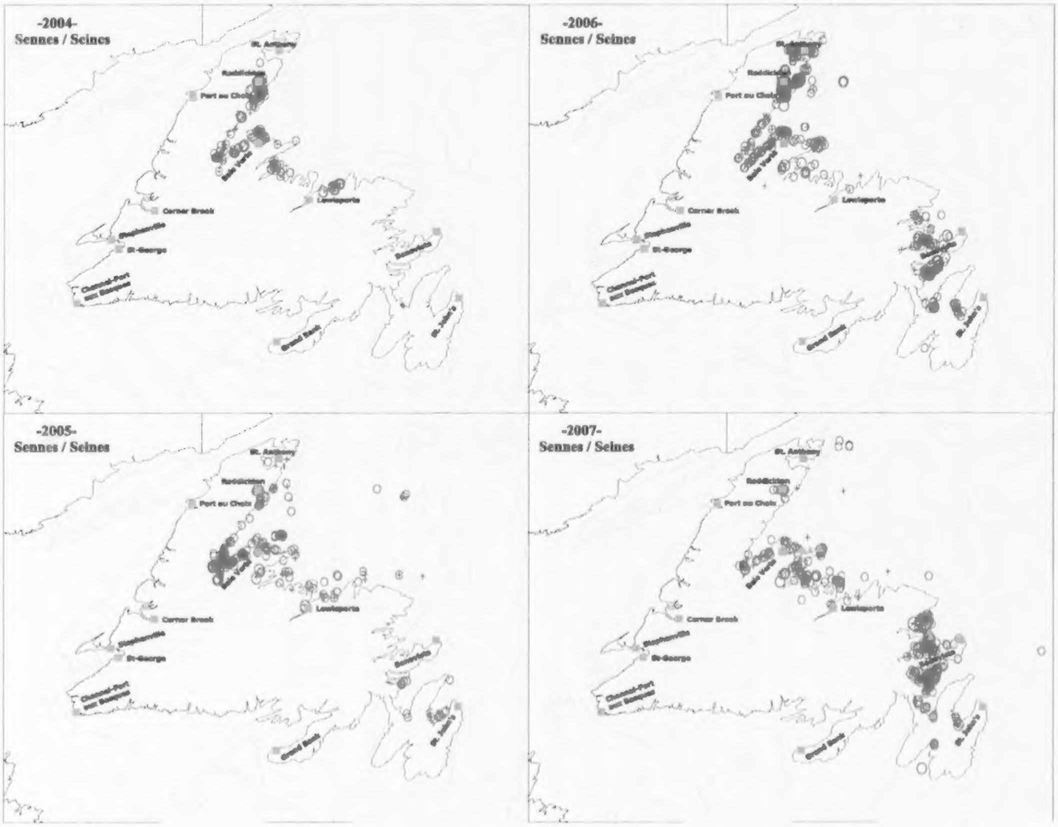
Petit senneur / Small seiner

+ 0 - 10 • 10 - 50 • 50 - 100 ● 100 - 150 ● > 150 t

Senne Tuck / Tuck seine

+ 0 - 10 · 10 - 50 ▲ 50 - 100 ▲ 100 - 150 ▲ > 150 t

Figure 9. *Locations of the Atlantic mackerel annual catches (t) of the small seiners (2000-2011) and Tuck-Ring seine (2005-2011) of NAFO Divisions 3KL.*


-2004-
Sennes / Seines
-2006-
Sennes / Seines
-2005-
Sennes / Seines
-2007-
Sennes / Seines
St. Anthony
Roddickton
Port au Choix
Baie Verte
Lewisporte
Corner Brook
Stephenville
St-George
Channel-Port aux Basques
Bonavista
St. John's
Grand Bank

LÉGENDE / LEGEND:

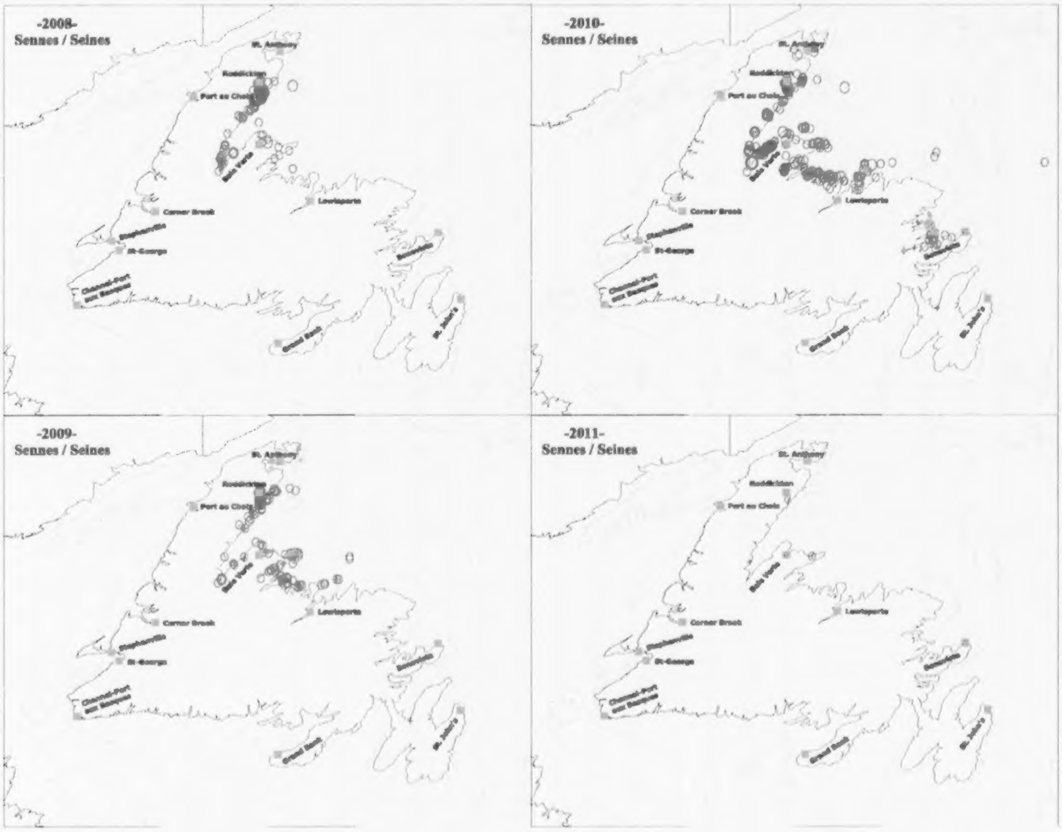
Petit senneur / Small seiner

+ 0 - 10 • 10 - 50 ● 50 - 100 ● 100 - 150 ● > 150 t

Senne Tuck / Tuck seine

+ 0 - 10 · 10 - 50 ▲ 50 - 100 ▲ 100 - 150 ▲ > 150 t

Figure 9. *(Continued).*


-2008-
Sennes / Seines
-2010-
Sennes / Seines
-2009-
Sennes / Seines
-2011-
Sennes / Seines
St. Anthony
Roddickton
Port au Choix
Baie Verte
Lewisporte
Corner Brook
Stephenville
St-George
Channel-Port aux Basques
Bonavista
Grand Bank
St. John's

LÉGENDE / LEGEND:

Petit senneur / Small seiner

+ **0 - 10** · **10 - 50** ● **50 - 100** ● **100 - 150** ● **> 150 t**

Senne Tuck / Tuck seine

+ **0 - 10** · **10 - 50** ▲ **50 - 100** ▲ **100 - 150** ▲ **> 150 t**

Figure 9. (Continued).

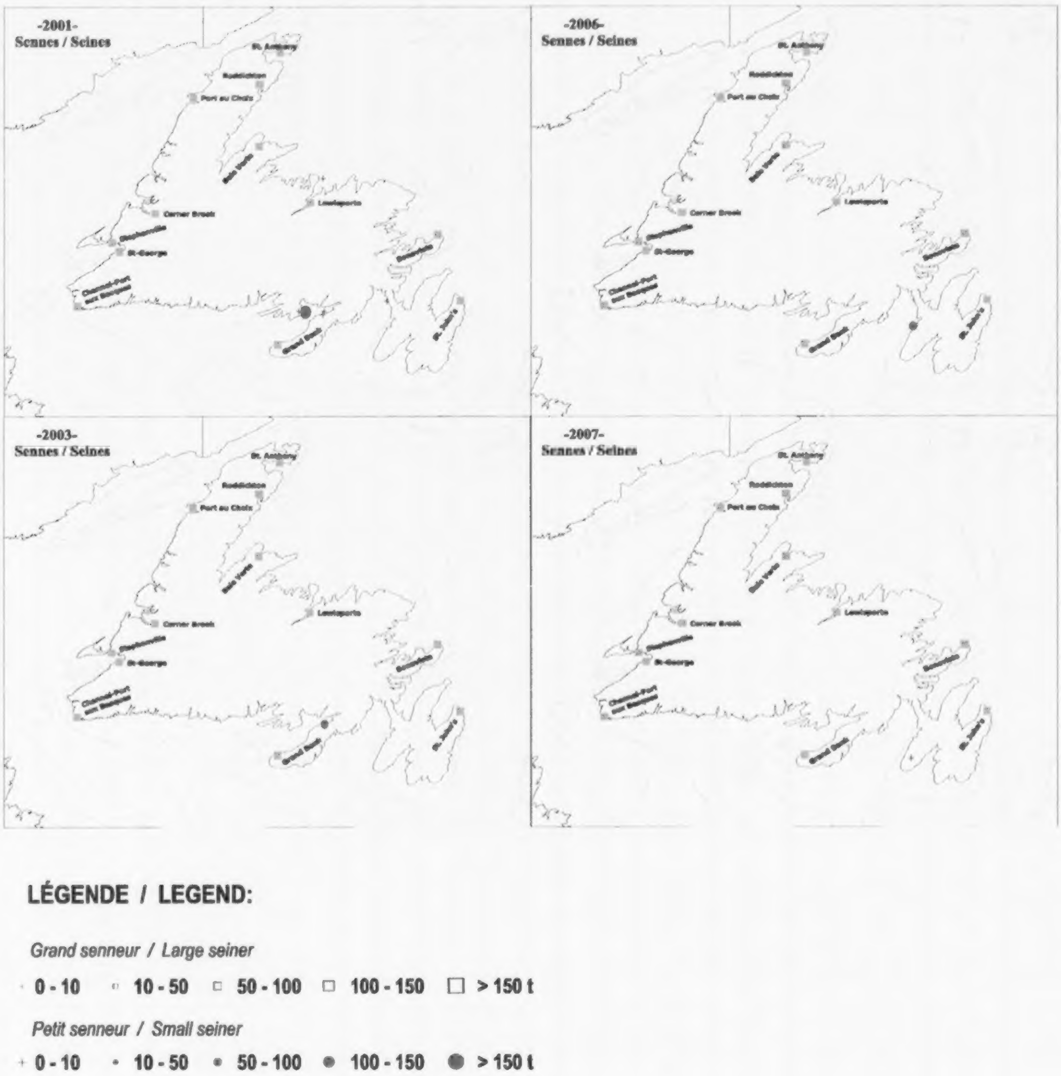

-2001-
Sennes / Seines
-2006-
Sennes / Seines
-2003-
Sennes / Seines
-2007-
Sennes / Seines
St. Anthony
Roddickton
Port au Choix
Corner Brook
Lewisporte
St-George
Grand Bank
St. John's
LÉGENDE / LEGEND:
Grand senneur / Large seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Petit senneur / Small seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t

Figure 10. *Locations of the Atlantic mackerel annual catches (t) of the large (2009-2011) and small seiners (2001-2011) of NAFO Division 3P.*

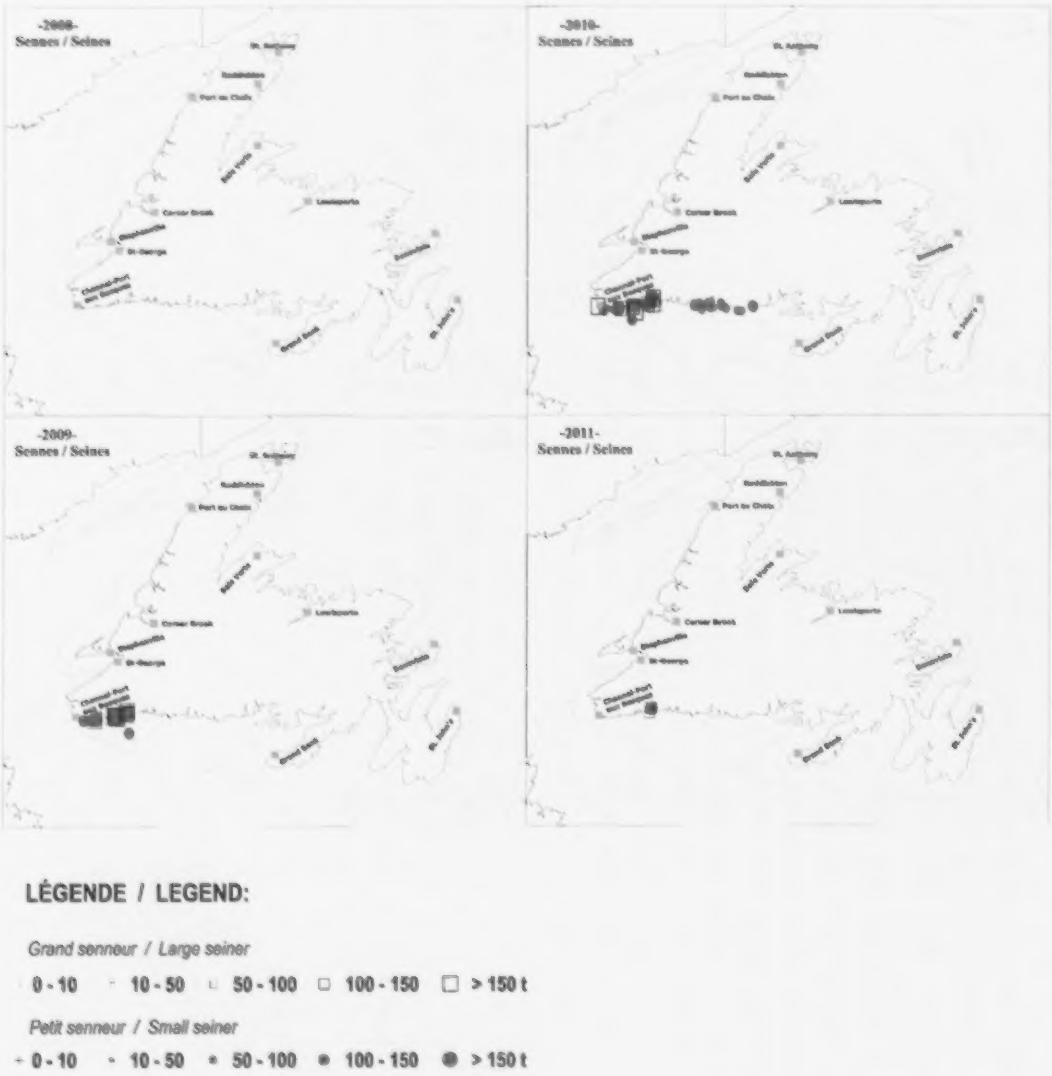
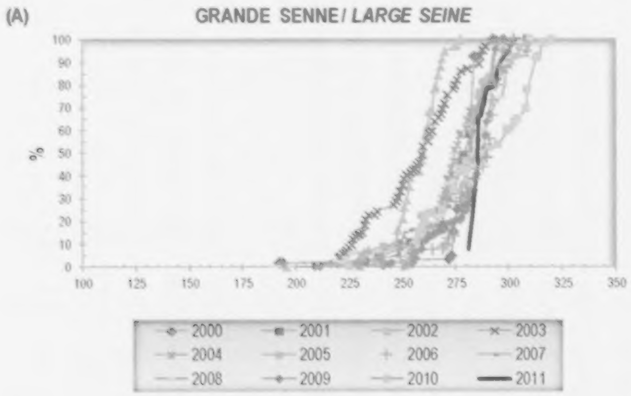
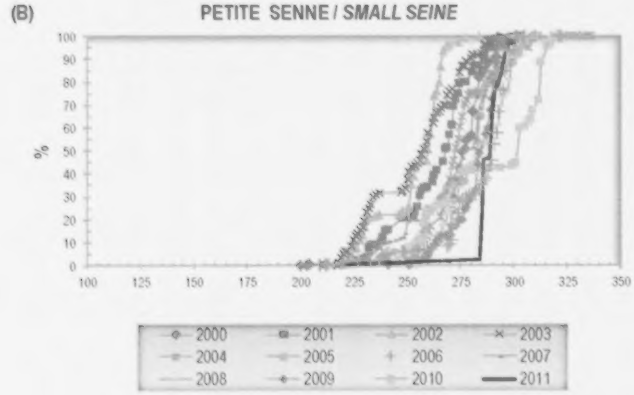

-2008-
Sennes / Seines
-2010-
Sennes / Seines
-2009-
Sennes / Seines
-2011-
Sennes / Seines
LÉGENDE / LEGEND:
Grand senneur / Large seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t
Petit senneur / Small seiner
0 - 10
10 - 50
50 - 100
100 - 150
> 150 t

Figure 10. (Continued).





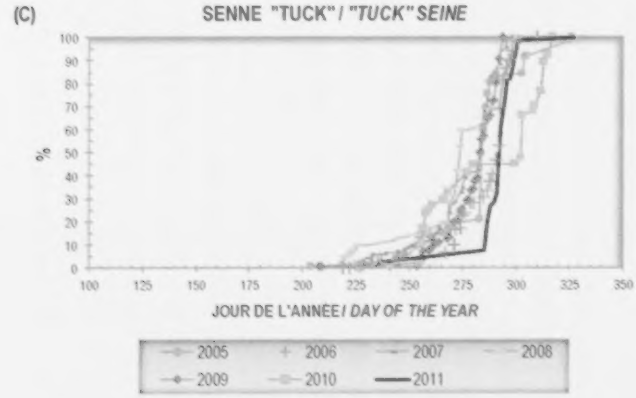


Figure 11. Cumulative landings (%) for each type of seine (A : large; B : small; C : Tuck-Ring) of the Atlantic mackerel fishery of NAFO Division 4R (Tuck-Ring seine is considered as a fixed gear) since 2000.

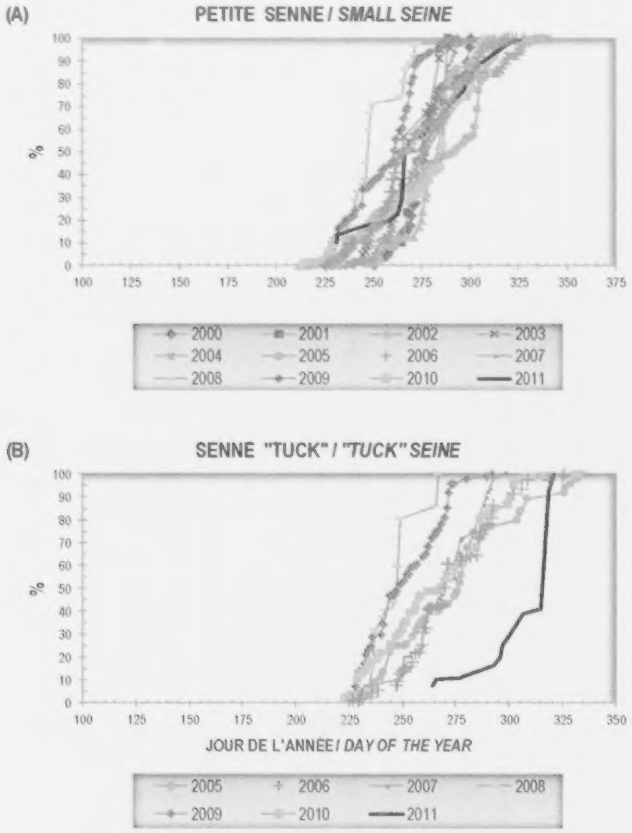


Figure 12. Cumulative landings (%) for each type of seine (A : small; B : Tuck-Ring) of the Atlantic mackerel fishery of NAFO Divisions 3KL (Tuck-Ring seine is considered as a fixed gear) since 2000.

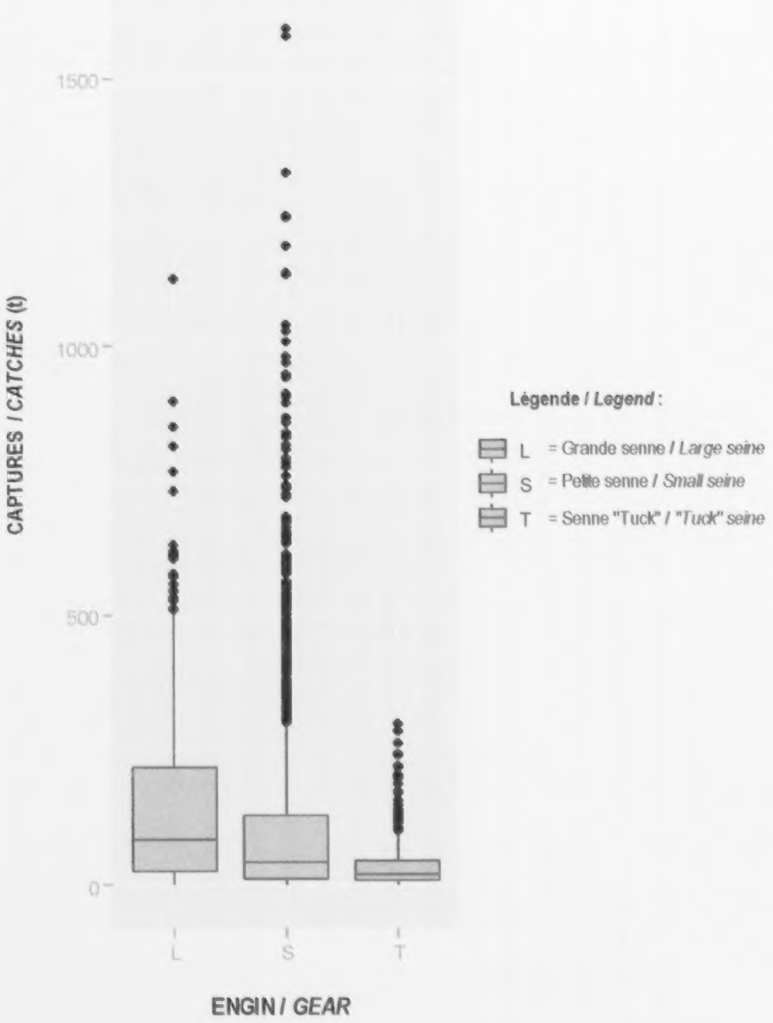


Figure 13. Box and whisker plots of the Atlantic mackerel catches (t) of the large and small seines (1985-2011) and Tuck-Ring seine (2005-2011) of NAFO Divisions 4R, 3KL, and 3P.

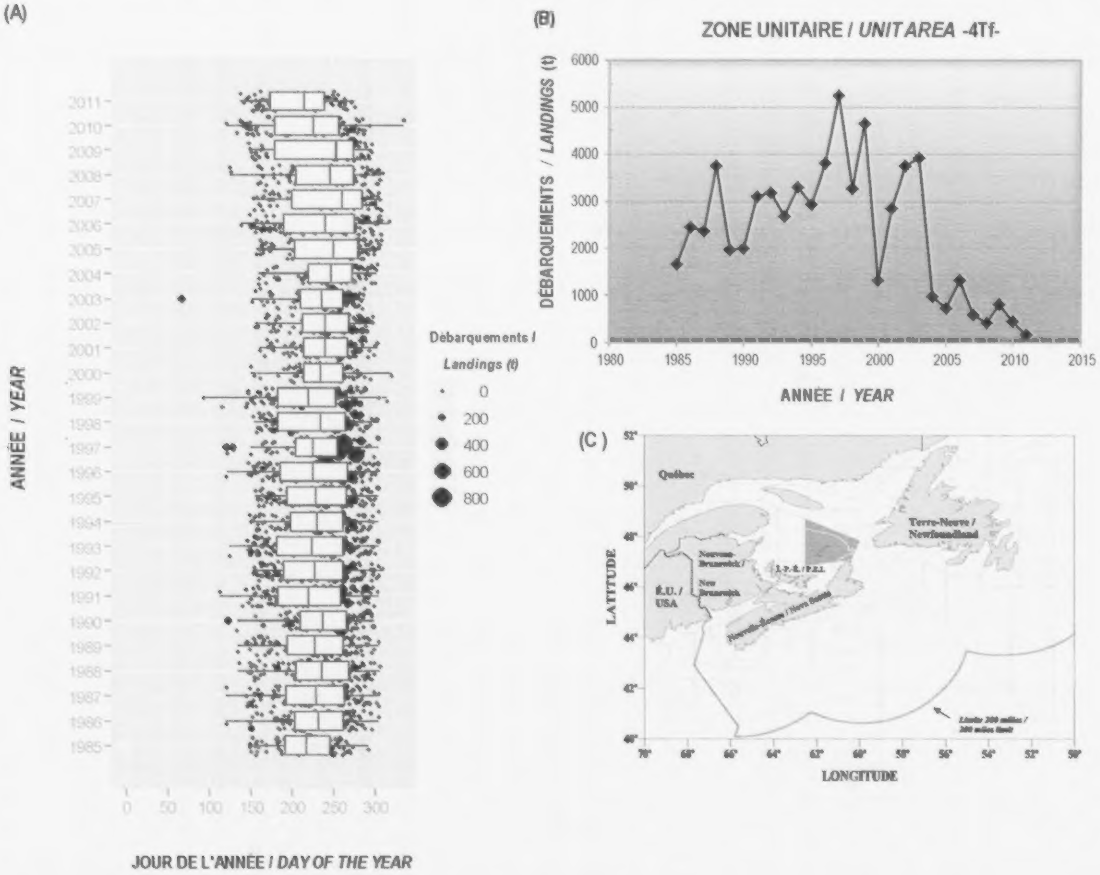


Figure 14. *Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in unit area 4Tf. Unit area 4Tf is indicated by the coloured area of the map (C).*

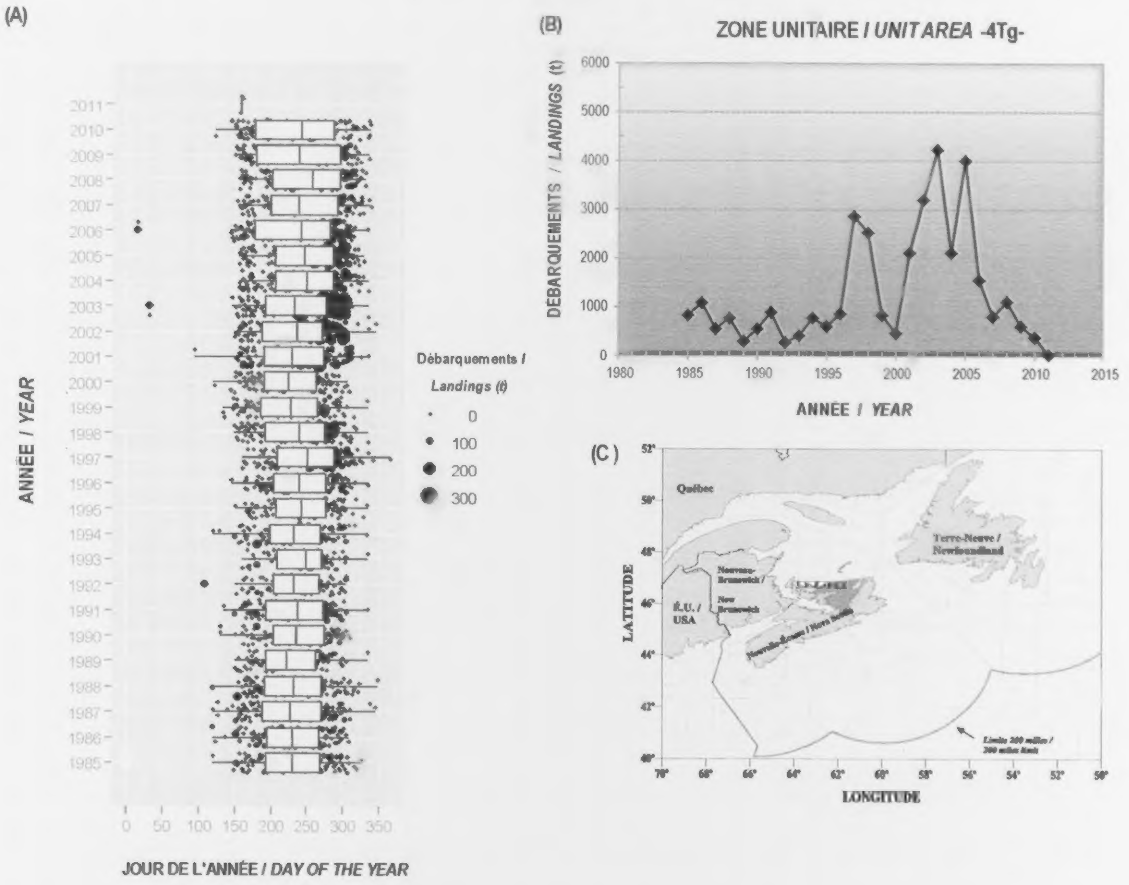


Figure 15. *Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in unit area 4Tg. Unit area 4Tg is indicated by the coloured area of the map (C).*

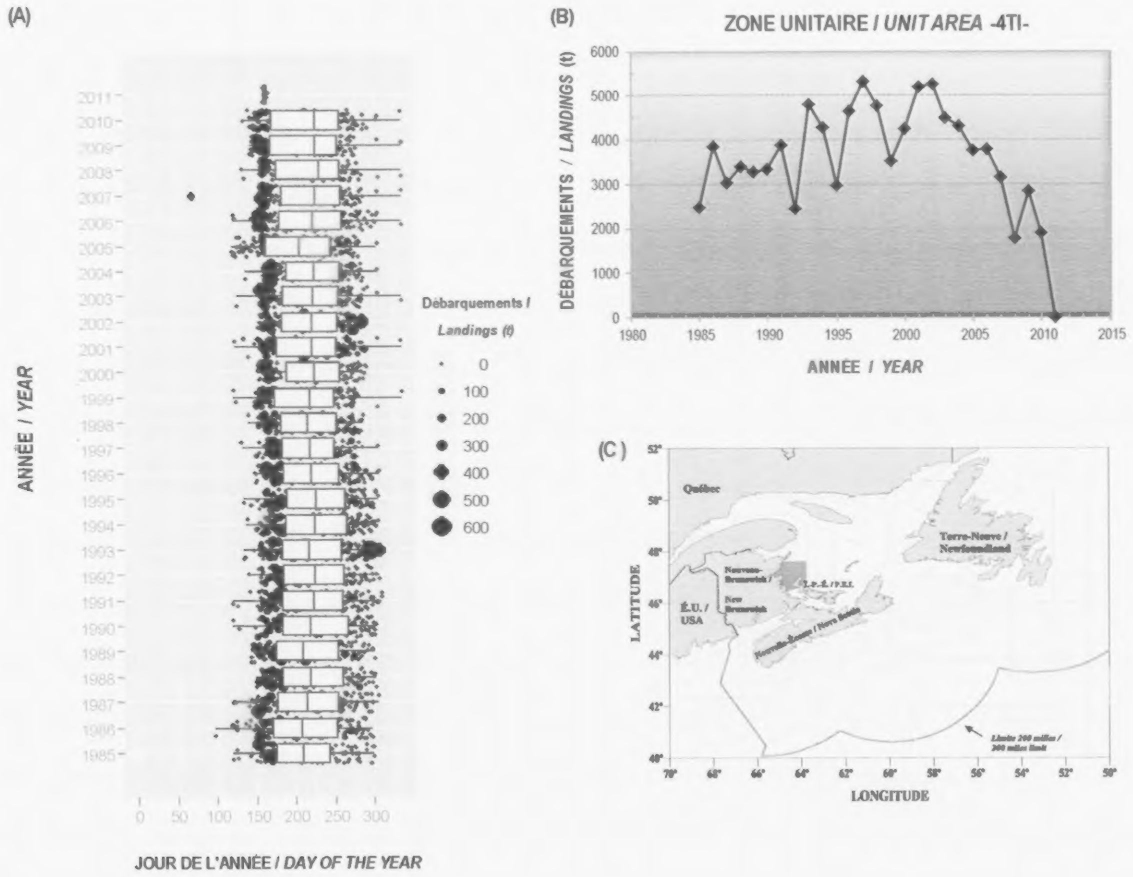


Figure 16. Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in unit area 4TI. Unit area 4TI is indicated by the coloured area of the map (C).

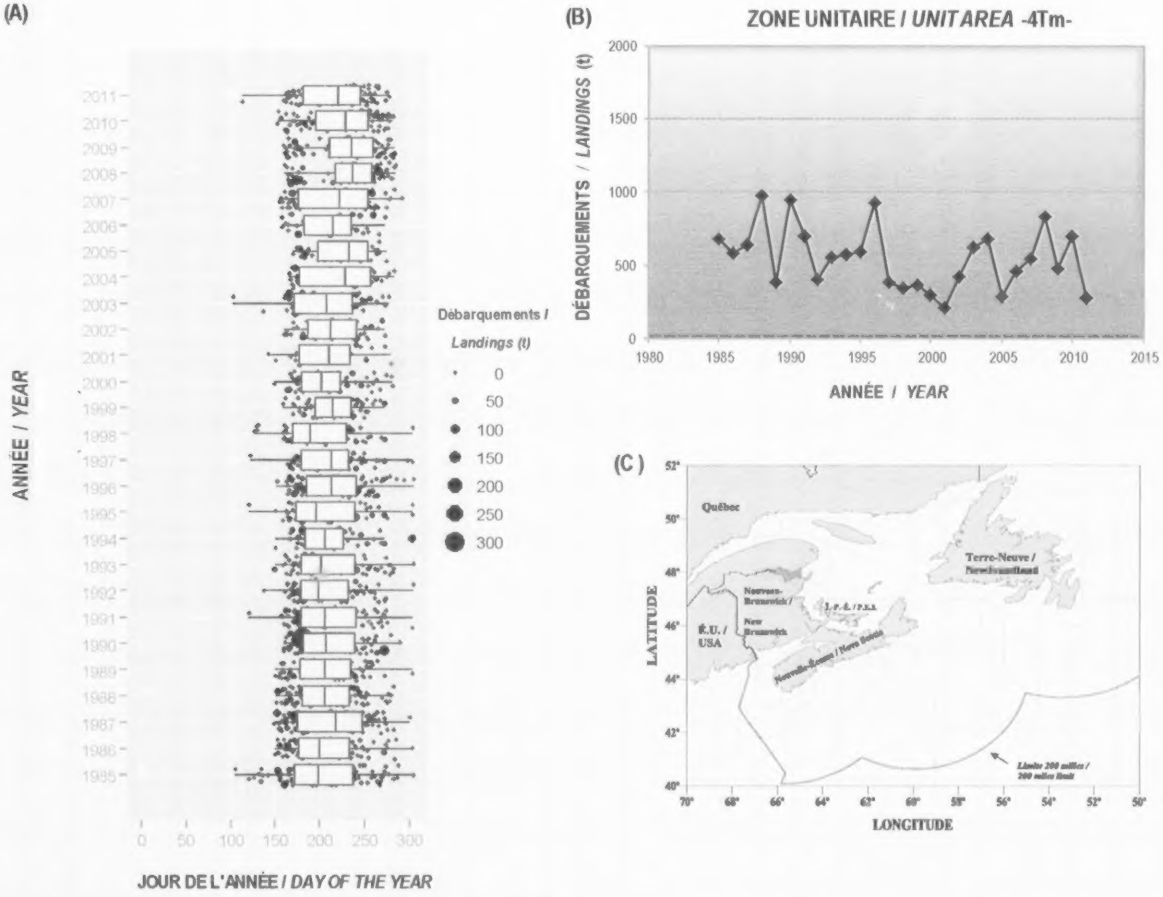


Figure 17. Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in unit area 4Tm. Unit area 4Tm is indicated by the coloured area of the map (C).

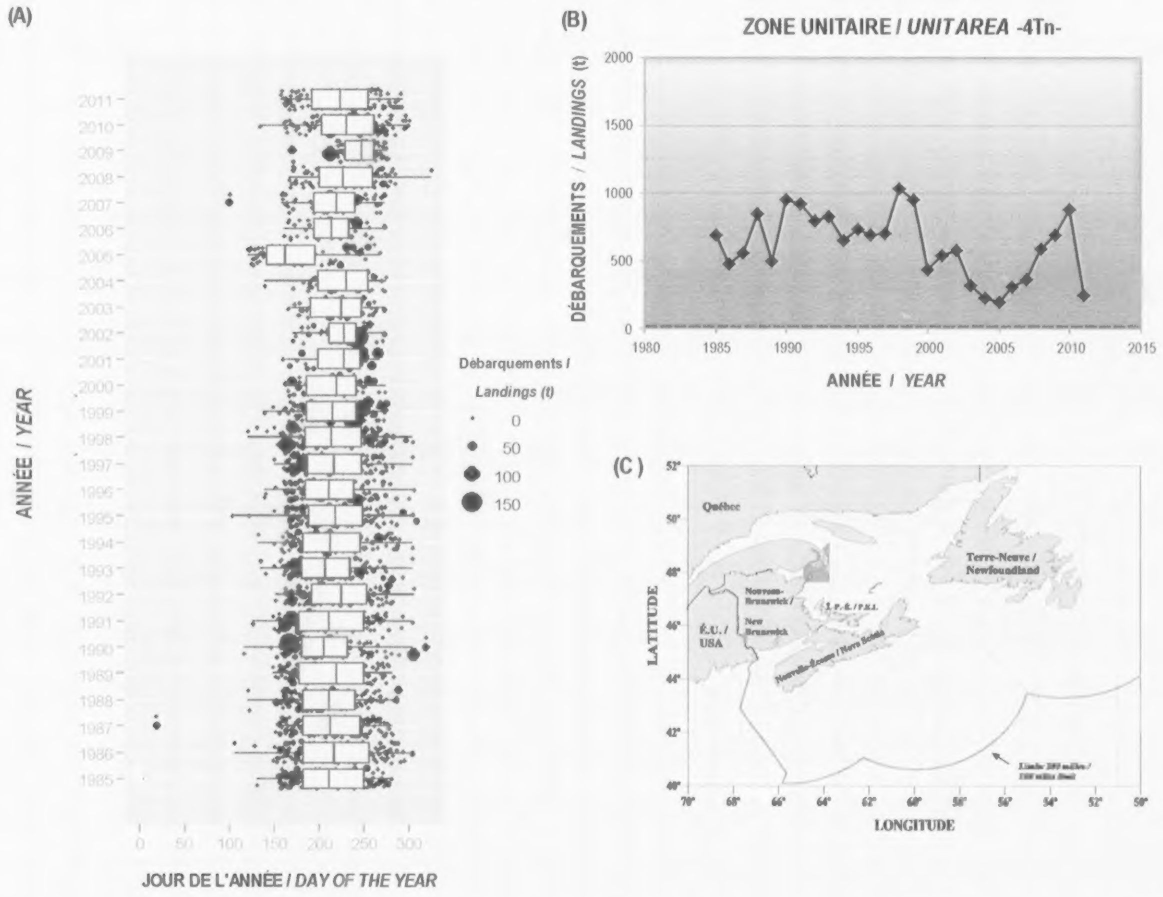


Figure 18. *Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in unit area 4Tn. Unit area 4Tn is indicated by the coloured area of the map (C).*

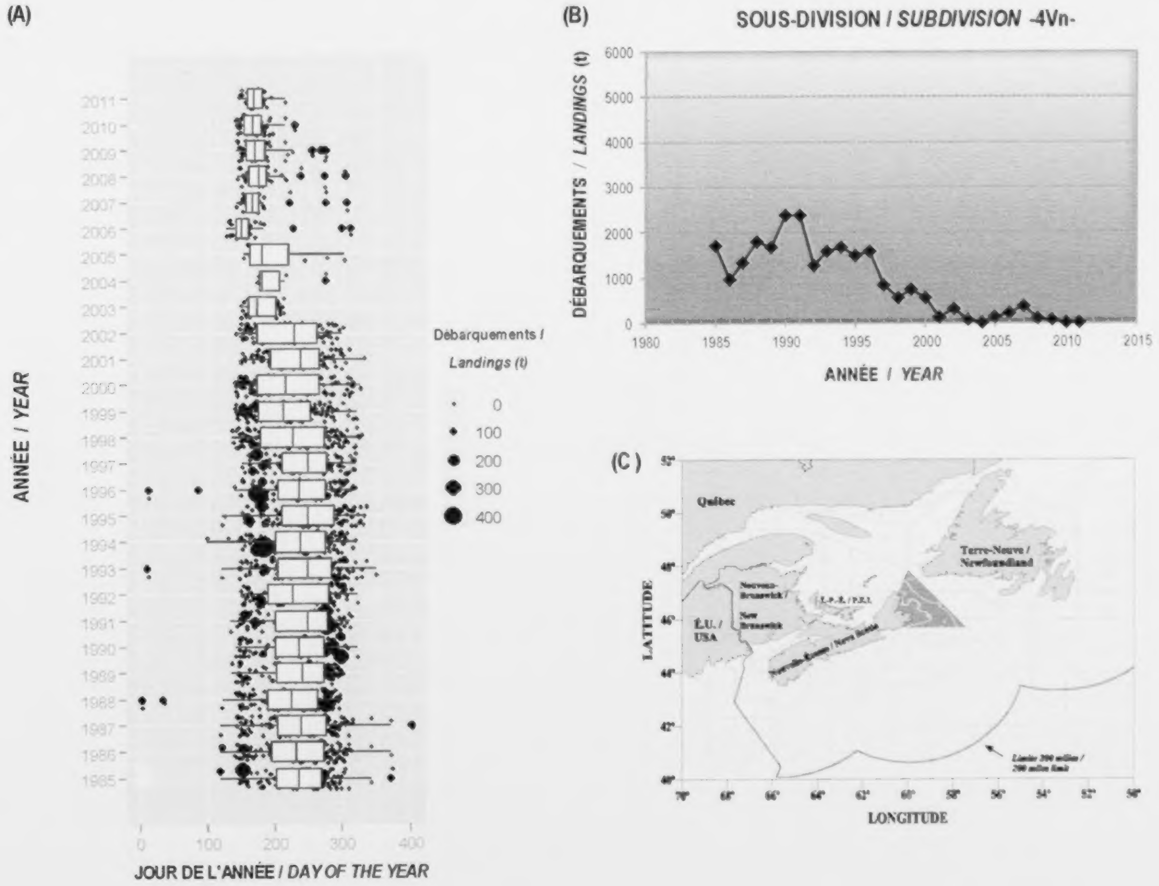


Figure 19. *Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in subdivision 4Vn. Subdivision 4Vn is indicated by the coloured area of the map (C).*

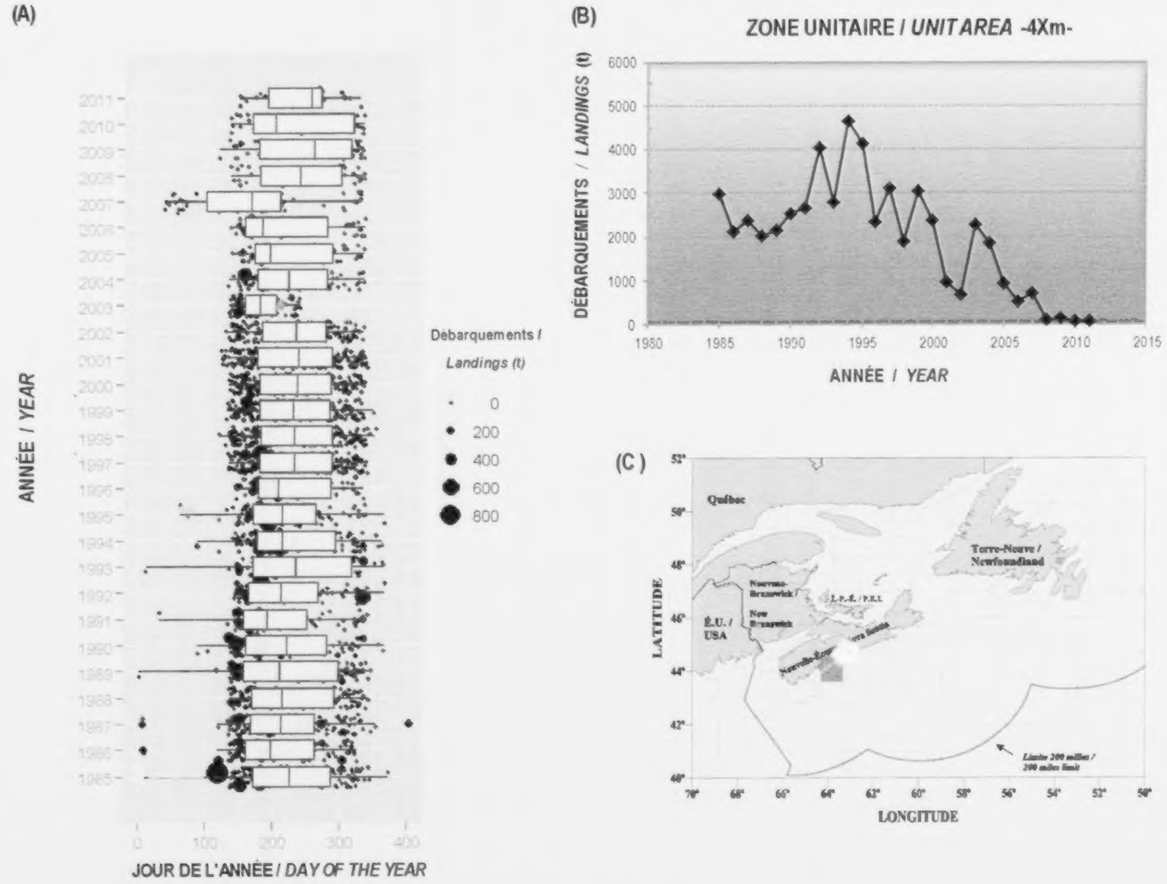


Figure 20. Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in unit area 4Xm. Unit area 4Xm is indicated by the coloured area of the map (C).

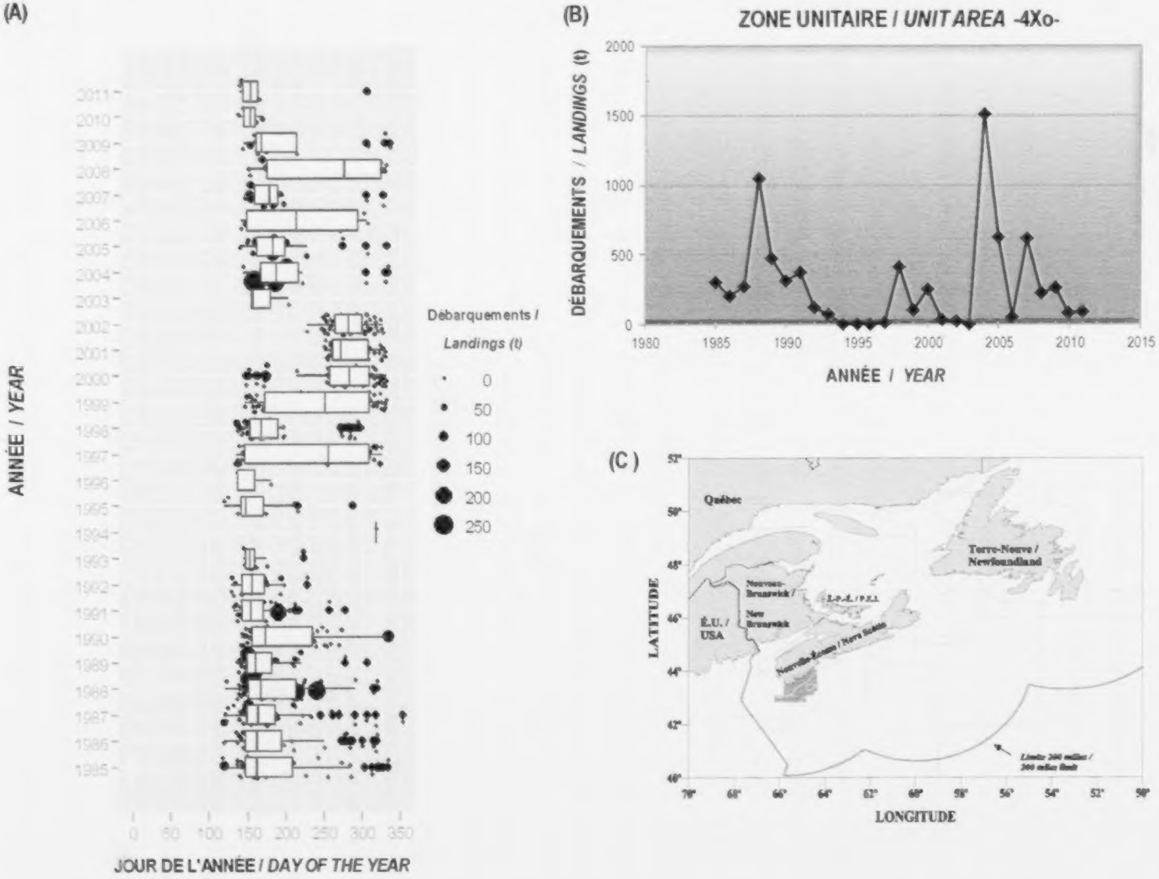
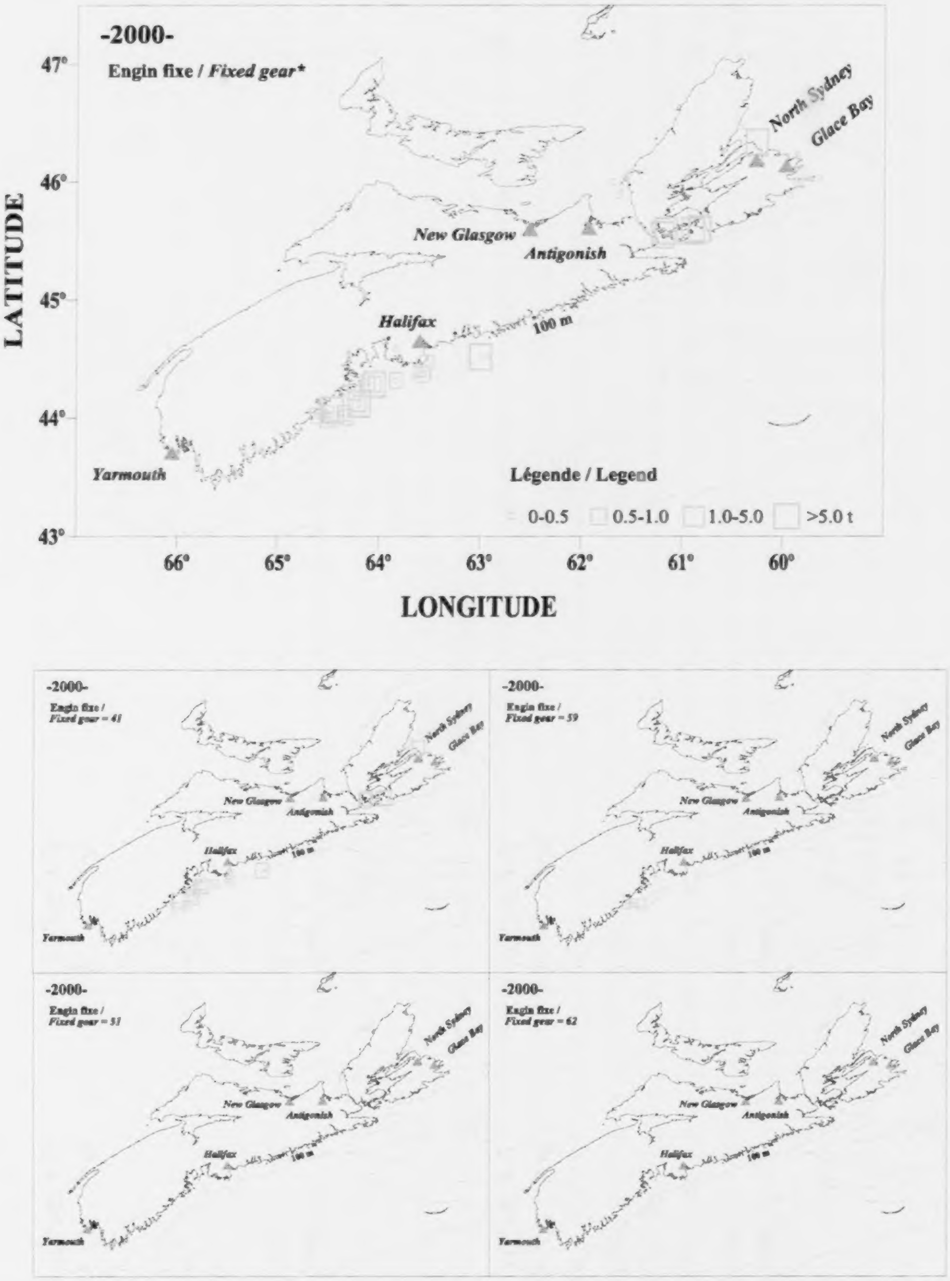
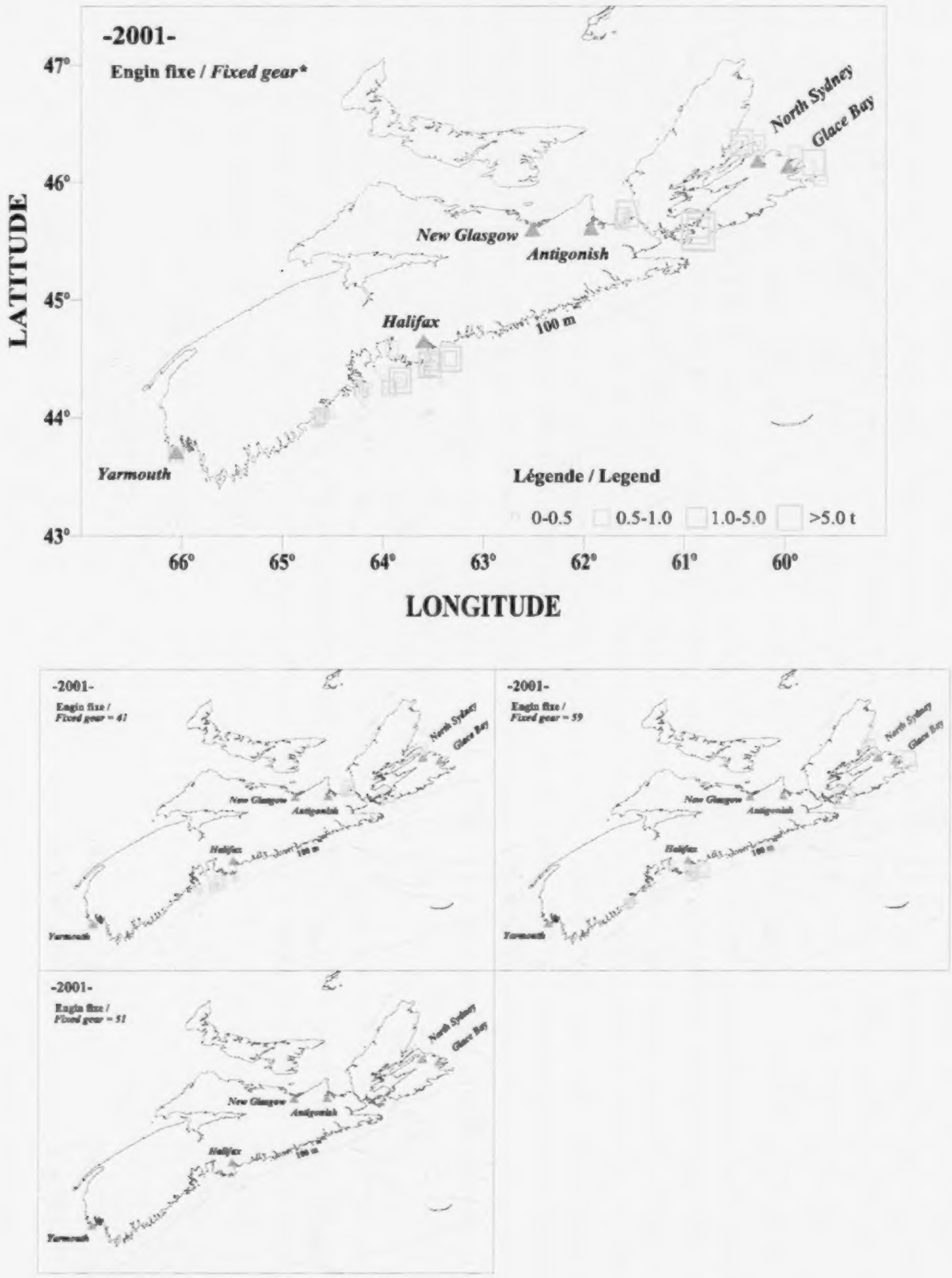


Figure 21. Box and whiskers plots of the Atlantic mackerel daily landings (t) (A) and annual landings (t) (B) in unit area 4Xo. Unit area 4Xo is indicated by the coloured area of the map (C).


-2000-
Engin fixe / *Fixed gear**
47°
46°
45°
44°
43°
LATITUDE
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
Engin fixe / Fixed gear = 41
Engin fixe / Fixed gear = 59
Engin fixe / Fixed gear = 51
Engin fixe / Fixed gear = 62

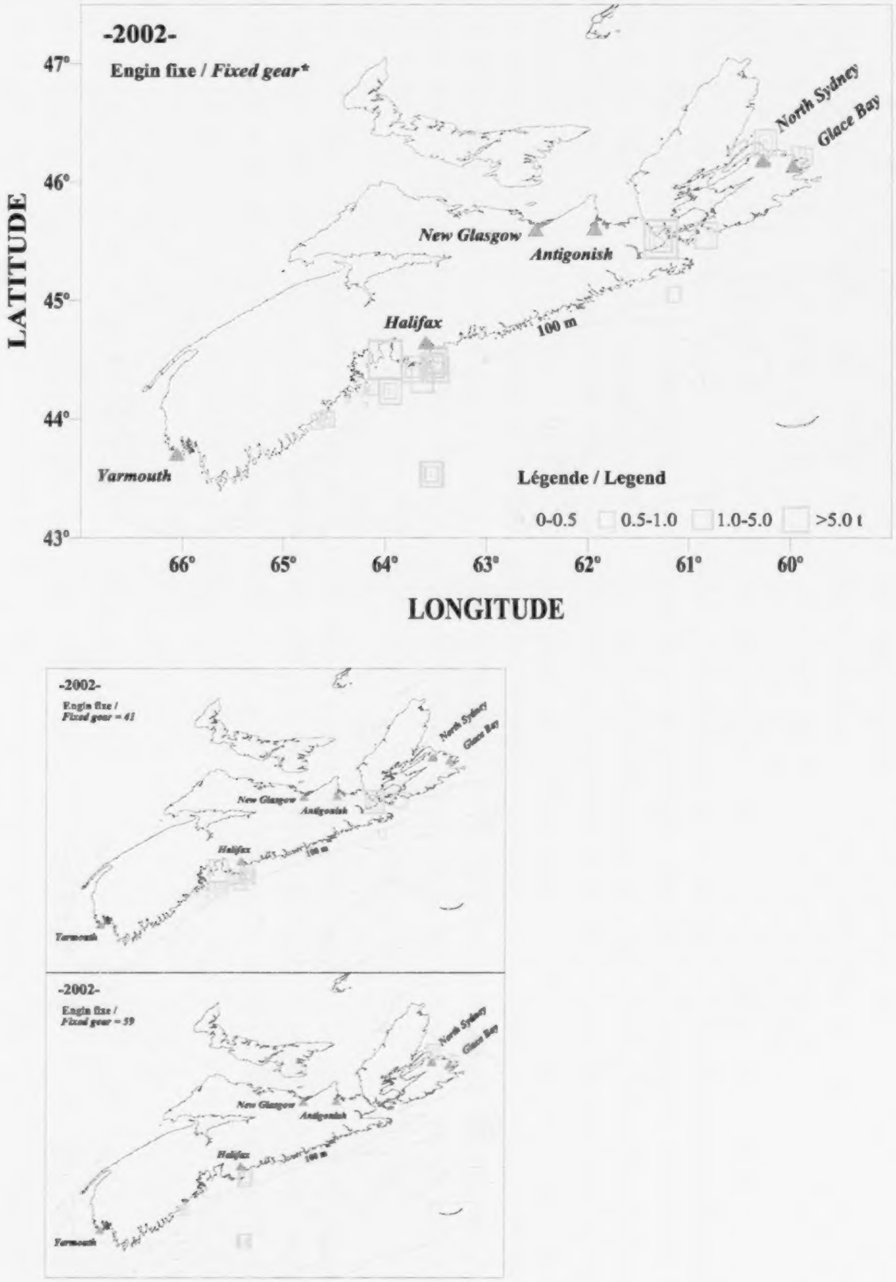
* 41= Filet maillant / *Gillnet* ; 51= Palangre / *Longline* ; 59= Ligne à la main / *Handline* ; 62= Casier / *Pot*

Figure 22. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2000 (source : ZIFF files).


-2001-
Engin fixe / Fixed gear*
47°
46°
45°
44°
43°
LATITUDE
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
-2001-
Engin fixe / Fixed gear = 41
-2001-
Engin fixe / Fixed gear = 59
-2001-
Engin fixe / Fixed gear = 51

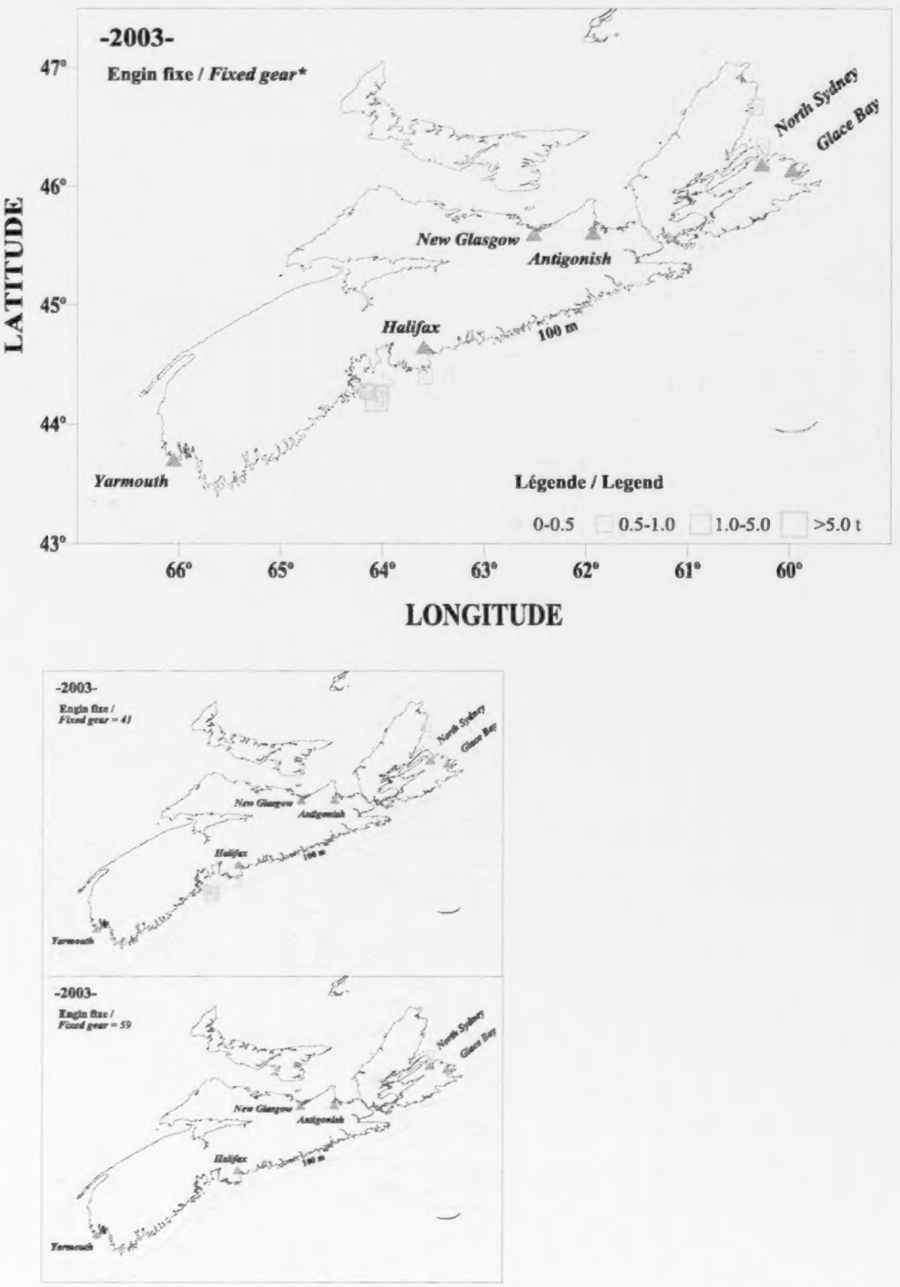
* 41= Filet maillant / *Gillnet* ; 51= Palangre / *Longline* ; 59= Ligne à la main / *Handline*

Figure 23. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2001 (source : ZIFF files).


-2002-
Engin fixe / Fixed gear*
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
47°
46°
45°
44°
43°
LATITUDE
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
-2002-
Engin fixe / Fixed gear = 41
-2002-
Engin fixe / Fixed gear = 59

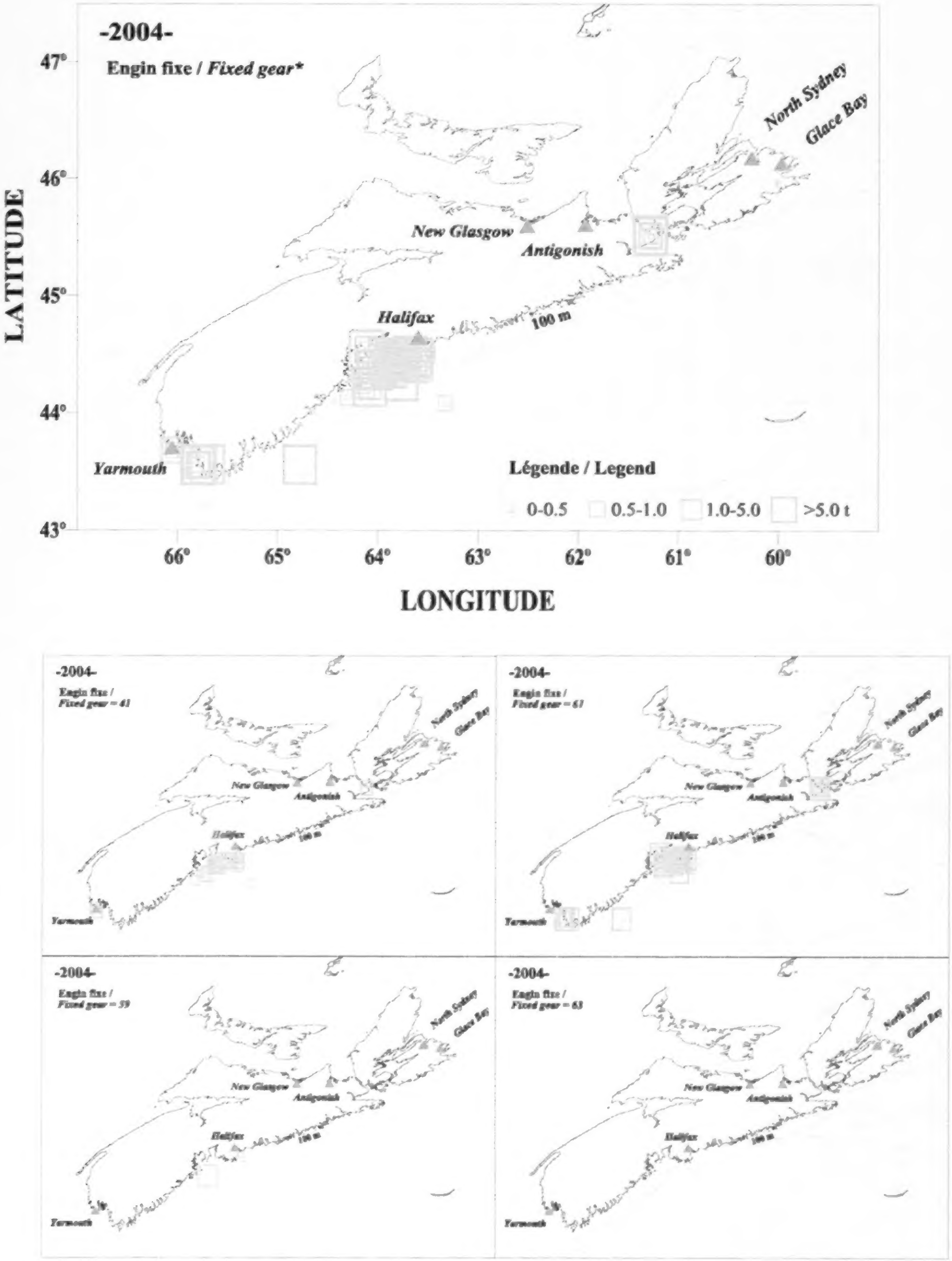
* 41= Filet maillant / *Gillnet* ; 59= Ligne à la main / *Handline*

Figure 24. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2002 (source : ZIFF files).


-2003-
Engin fixe / *Fixed gear**
47°
46°
45°
44°
43°
LATITUDE
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
-2003-
Engin fixe /
Fixed gear = 41
-2003-
Engin fixe /
Fixed gear = 59

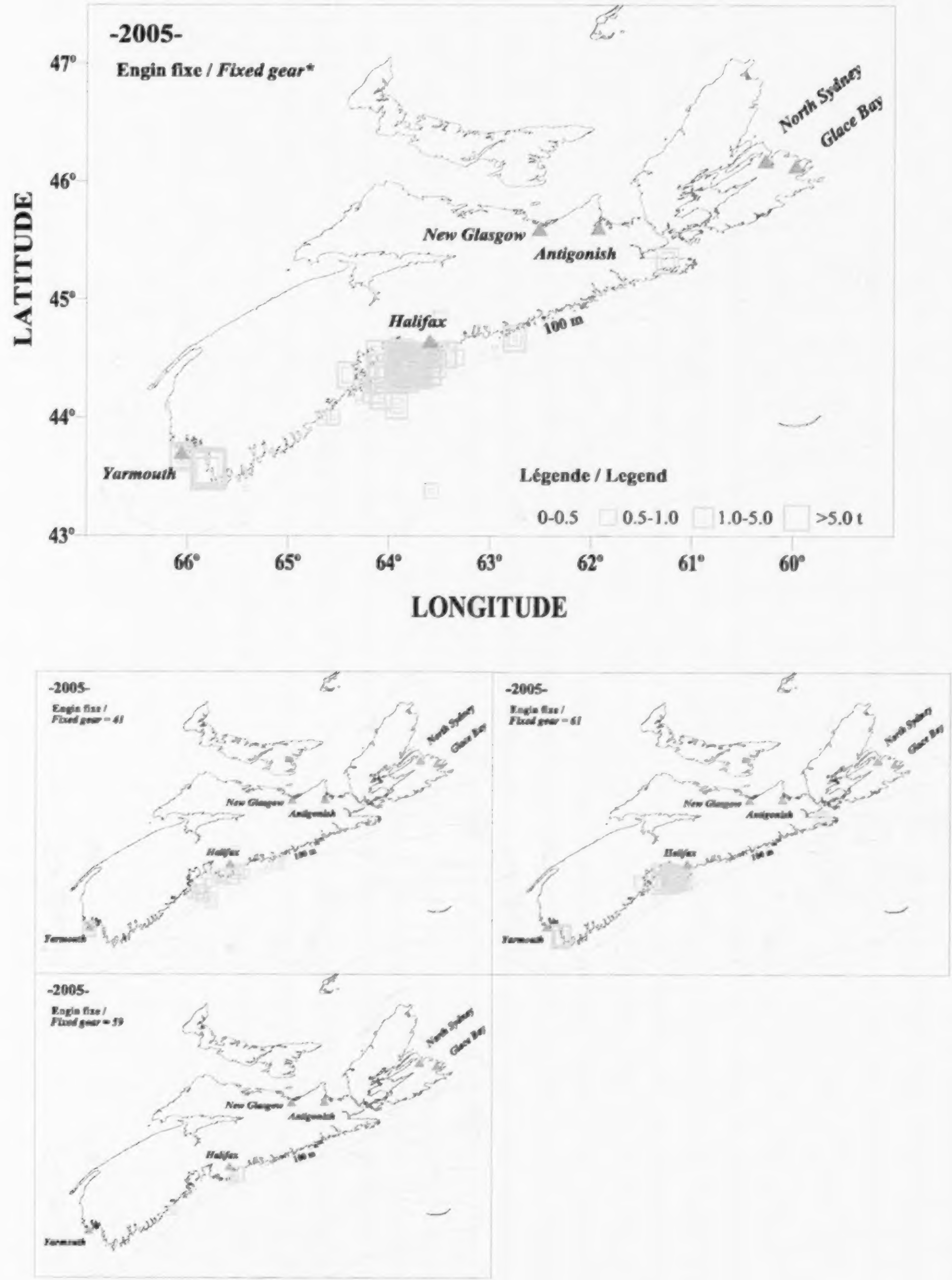
* 41= Filet maillant / *Gillnet* ; 59= Ligne à la main / *Handline*

Figure 25. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2003 (source : ZIFF files).


-2004-
Engin fixe / Fixed gear*
47°
46°
45°
44°
43°
LATITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
-2004-
Engin fixe / Fixed gear = 41
-2004-
Engin fixe / Fixed gear = 61
-2004-
Engin fixe / Fixed gear = 59
-2004-
Engin fixe / Fixed gear = 63

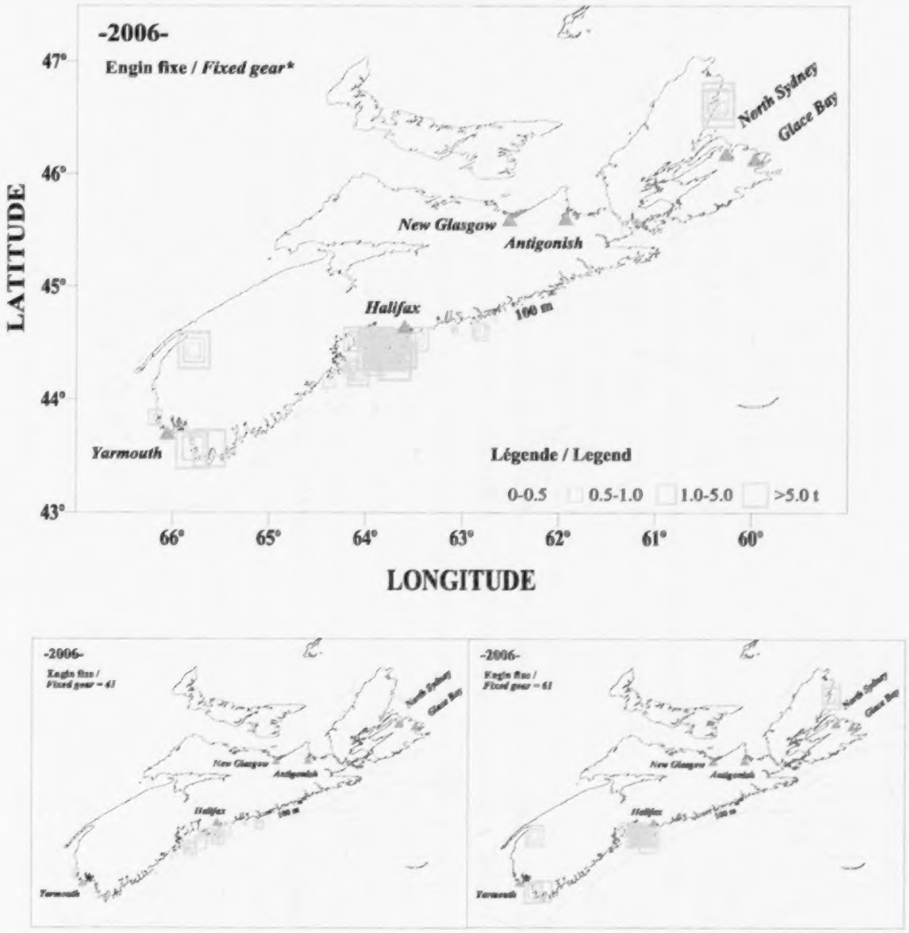
* 41 = Filet maillant / *Gillnet* ; 59 = Ligne à la main / *Handline* ; 61 = Trappe / *Trap* ; 63 = Fascine / *Weir*

Figure 26. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2004 (source : ZIFF files).


-2005-
Engin fixe / Fixed gear*
47°
46°
45°
44°
43°
LATITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
-2005-
Engin fixe / Fixed gear = 41
-2005-
Engin fixe / Fixed gear = 61
-2005-
Engin fixe / Fixed gear = 59

* 41 = Filet maillant / *Gillnet* ; 59 = Ligne à la main / *Handline* ; 61 = Trappe / *Trap*

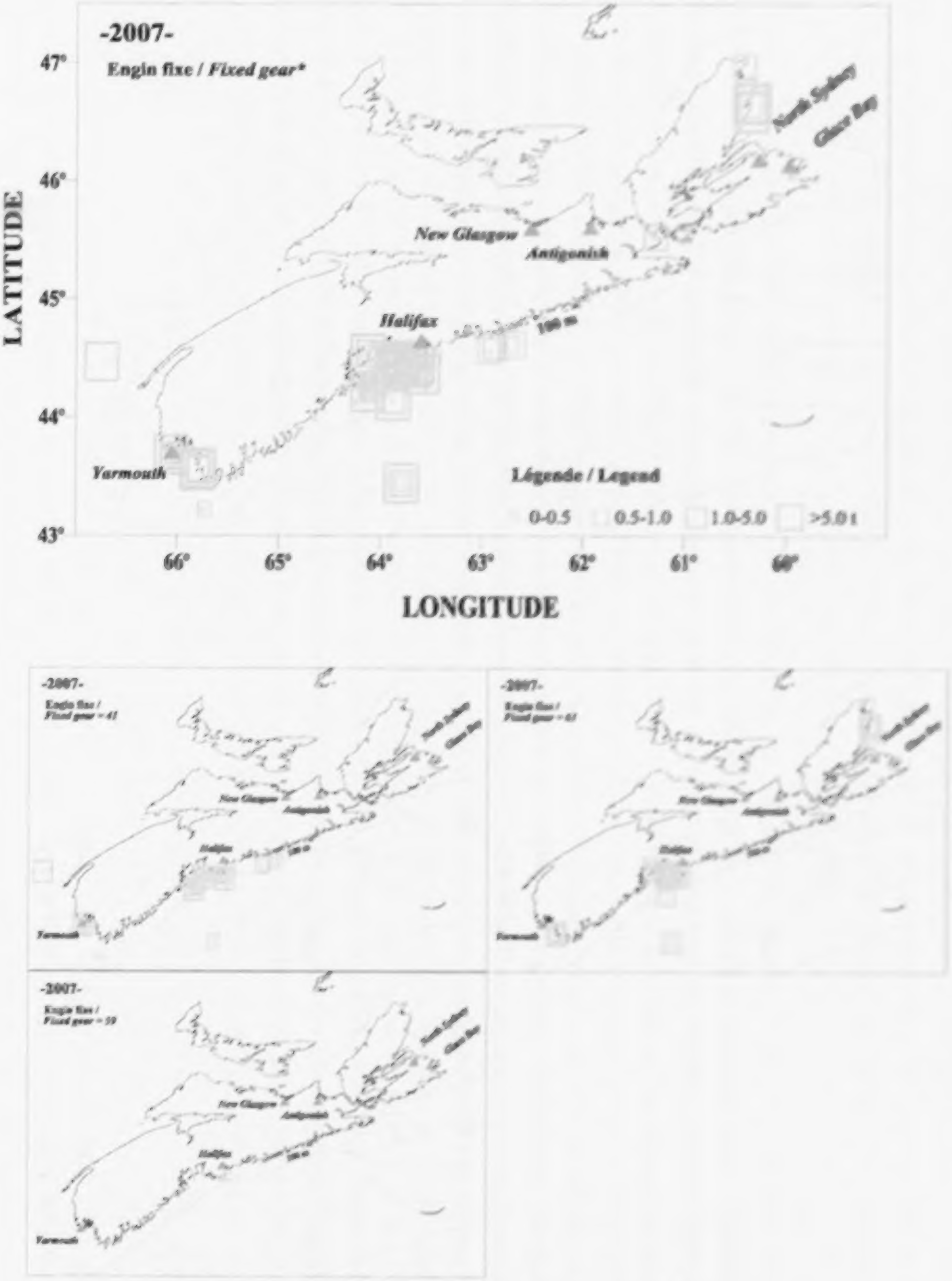
Figure 27. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2005 (source : ZIFF files).



-2006-
Engin fixe / *Fixed gear**
47°
46°
45°
44°
43°
LATITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
-2006-
Engin fixe / Fixed gear = 41
-2006-
Engin fixe / Fixed gear = 61

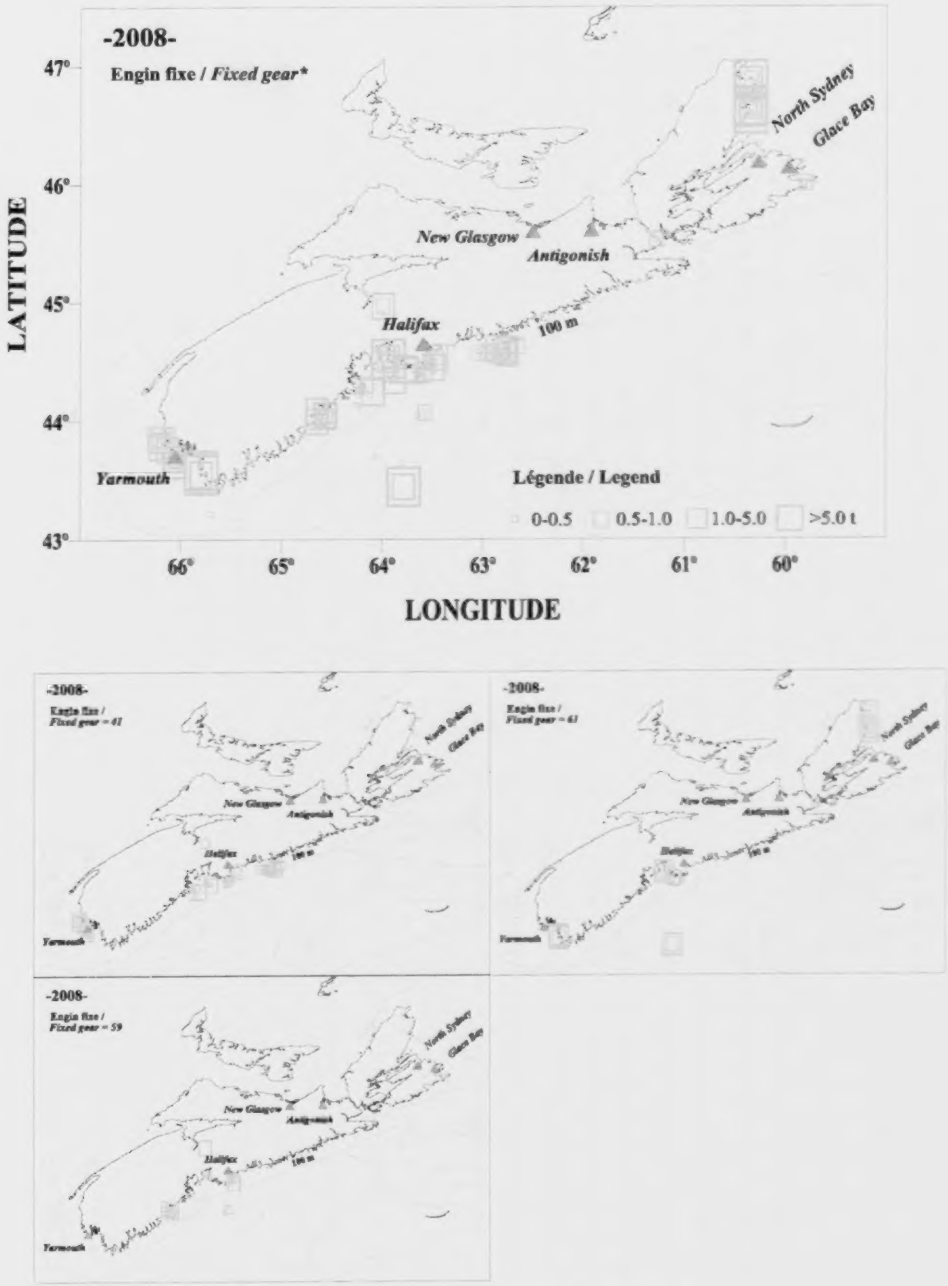
* 41= Filet maillant / *Gillnet* ; 61= Trappe / *Trap*

Figure 28. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2006 (source : ZIFF files).


-2007-
Engin fixe / *Fixed gear**
47°
46°
45°
44°
43°
LATITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
-2007-
Engin fixe / Fixed gear = 41
-2007-
Engin fixe / Fixed gear = 61
-2007-
Engin fixe / Fixed gear = 59

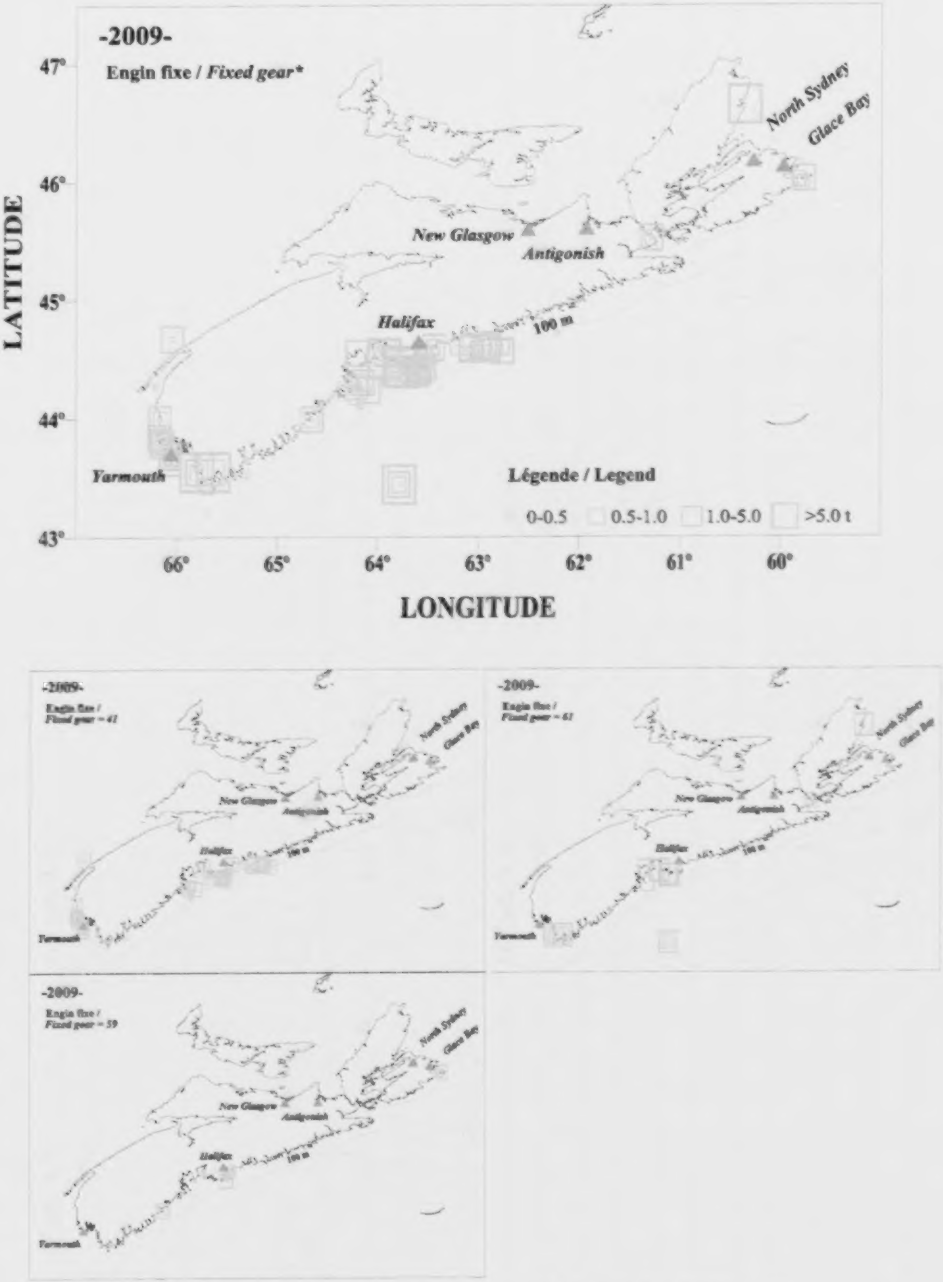
* 41= Filet maillant / *Gillnet* ; 59= Ligne à la main / *Handline* ; 61= Trappe / *Trap*

Figure 29. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2007 (source : ZIFF files).


-2008-
Engin fixe / *Fixed gear**
47°
46°
45°
44°
43°
LATITUDE
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
Engin fixe / Fixed gear = 41
Engin fixe / Fixed gear = 61
Engin fixe / Fixed gear = 59

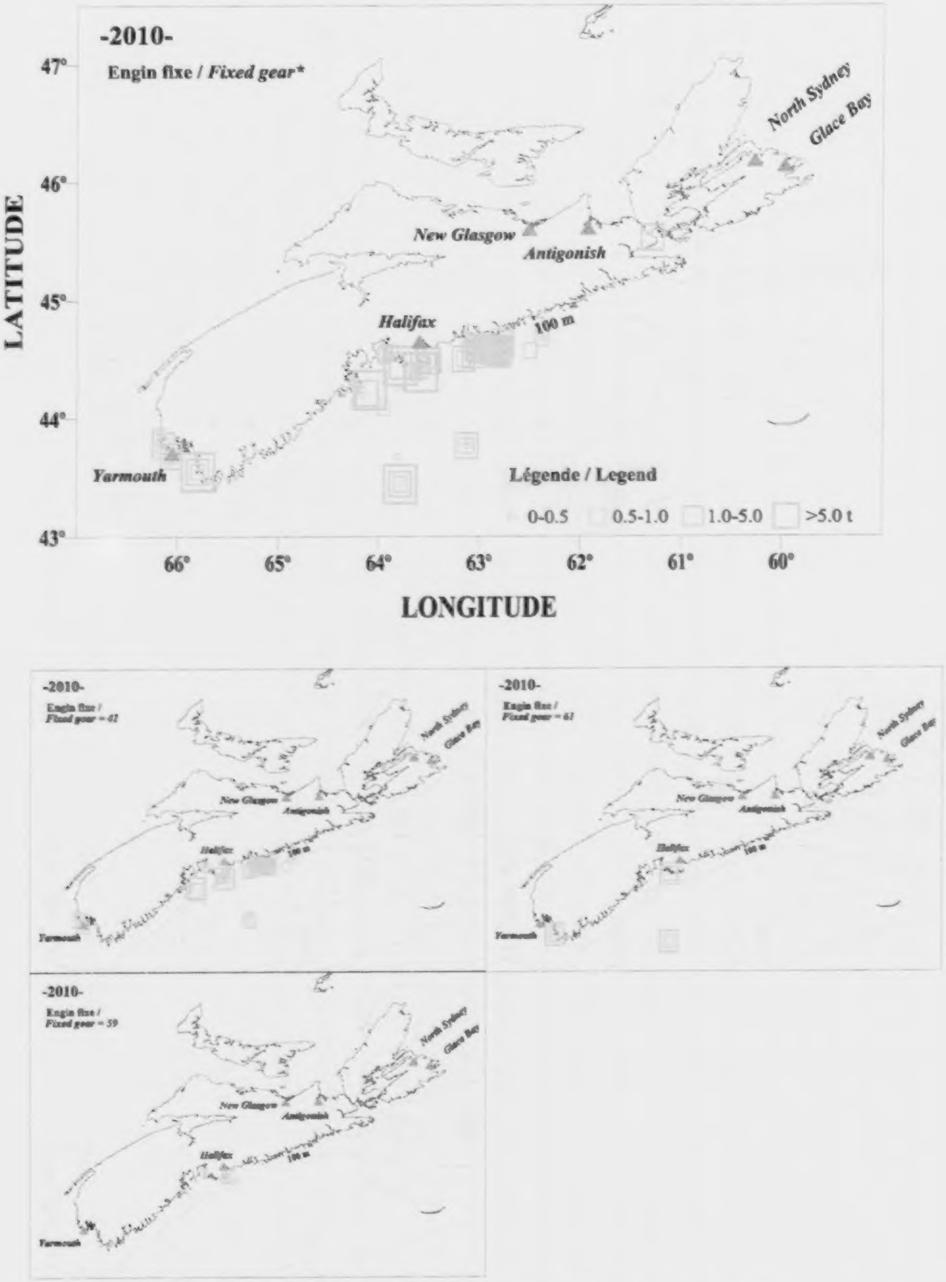
* 41= Filet maillant / *Gillnet* ; 59= Ligne à la main / *Handline* ; 61= Trappe / *Trap*

Figure 30. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2008 (source : ZIFF files).


-2009-
Engin fixe / Fixed gear*
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
47°
46°
45°
44°
43°
LATITUDE
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
Engin fixe / Fixed gear = 41
Engin fixe / Fixed gear = 61
Engin fixe / Fixed gear = 59

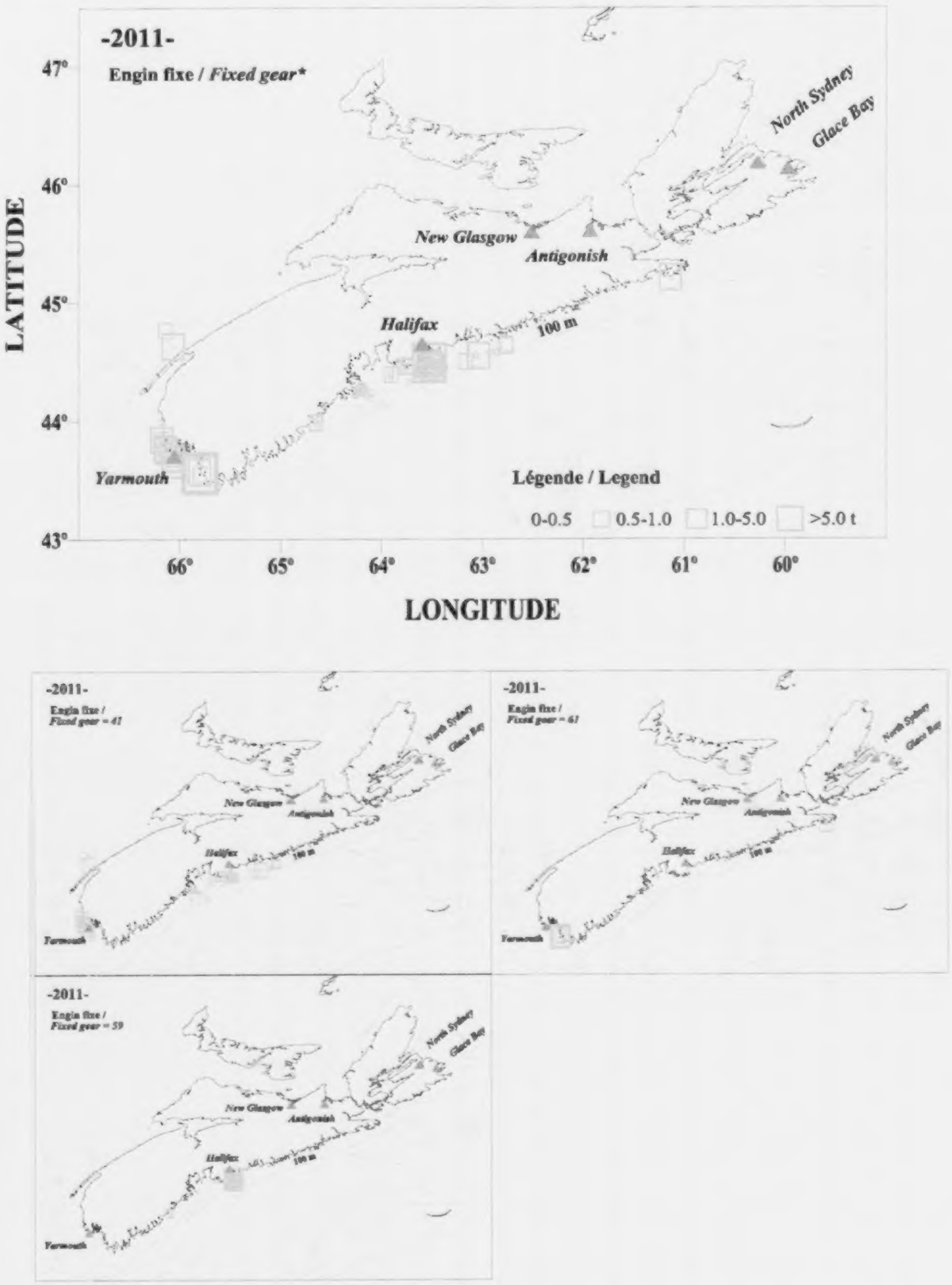
* 41= Filet maillant / *Gillnet* ; 59= Ligne à la main / *Handline* ; 61= Trappe / *Trap*

Figure 31. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2009 (source : ZIFF files).


-2010-
Engin fixe / Fixed gear*
LATITUDE
47°
46°
45°
44°
43°
LONGITUDE
66°
65°
64°
63°
62°
61°
60°
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
-2010-
Engin fixe / Fixed gear = 41
-2010-
Engin fixe / Fixed gear = 61
-2010-
Engin fixe / Fixed gear = 59

* 41= Filet maillant / *Gillnet* ; 59= Ligne à la main / *Handline* ; 61= Trappe / *Trap*

Figure 32. Atlantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2010 (source : ZIFF files).


-2011-
Engin fixe / Fixed gear*
47°
46°
45°
44°
43°
LATITUDE
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
66°
65°
64°
63°
62°
61°
60°
LONGITUDE
-2011-
Engin fixe / Fixed gear = 41
-2011-
Engin fixe / Fixed gear = 61
-2011-
Engin fixe / Fixed gear = 59

* 41= Filet maillant / *Gillnet* ; 59= Ligne à la main / *Handline* ; 61= Trappe / *Trap*

Figure 33. Atilantic mackerel catches (t) locations by fixed gear in Nova Scotia in 2011 (source : ZIFF files).

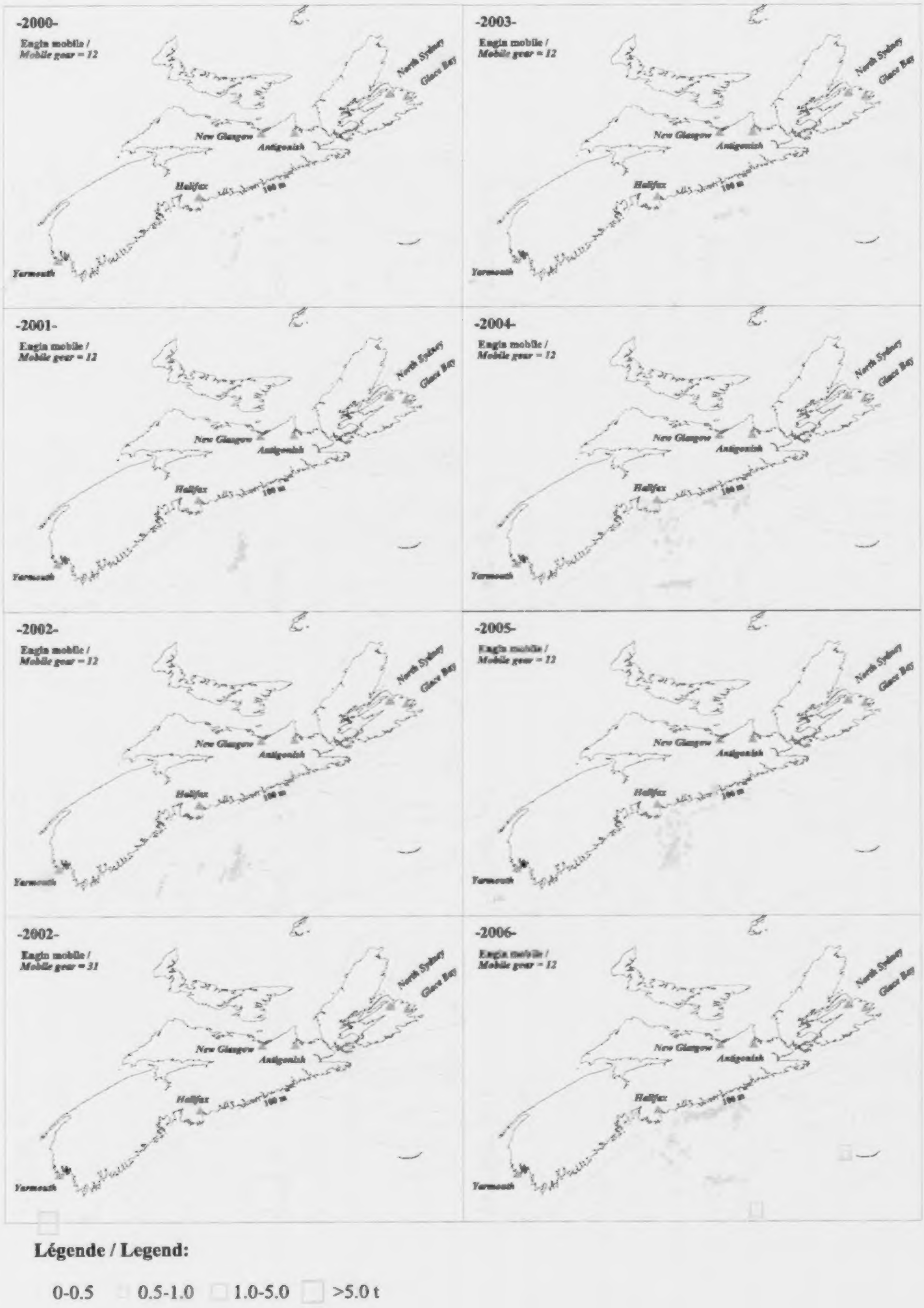

-2000-
Engin mobile / Mobile gear = 12
-2001-
Engin mobile / Mobile gear = 12
-2002-
Engin mobile / Mobile gear = 12
-2002-
Engin mobile / Mobile gear = 31
-2003-
Engin mobile / Mobile gear = 12
-2004-
Engin mobile / Mobile gear = 12
-2005-
Engin mobile / Mobile gear = 12
-2006-
Engin mobile / Mobile gear = 12
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend:
0-0.5
0.5-1.0
1.0-5.0
>5.0 t

Figure 34. *Atlantic mackerel catches (t) locations by mobile gear (12= bottom trawl; 15= midwater trawl; 31= purse seine) in Nova Scotia from 2000 to 2011 (source : ZIFF files).*

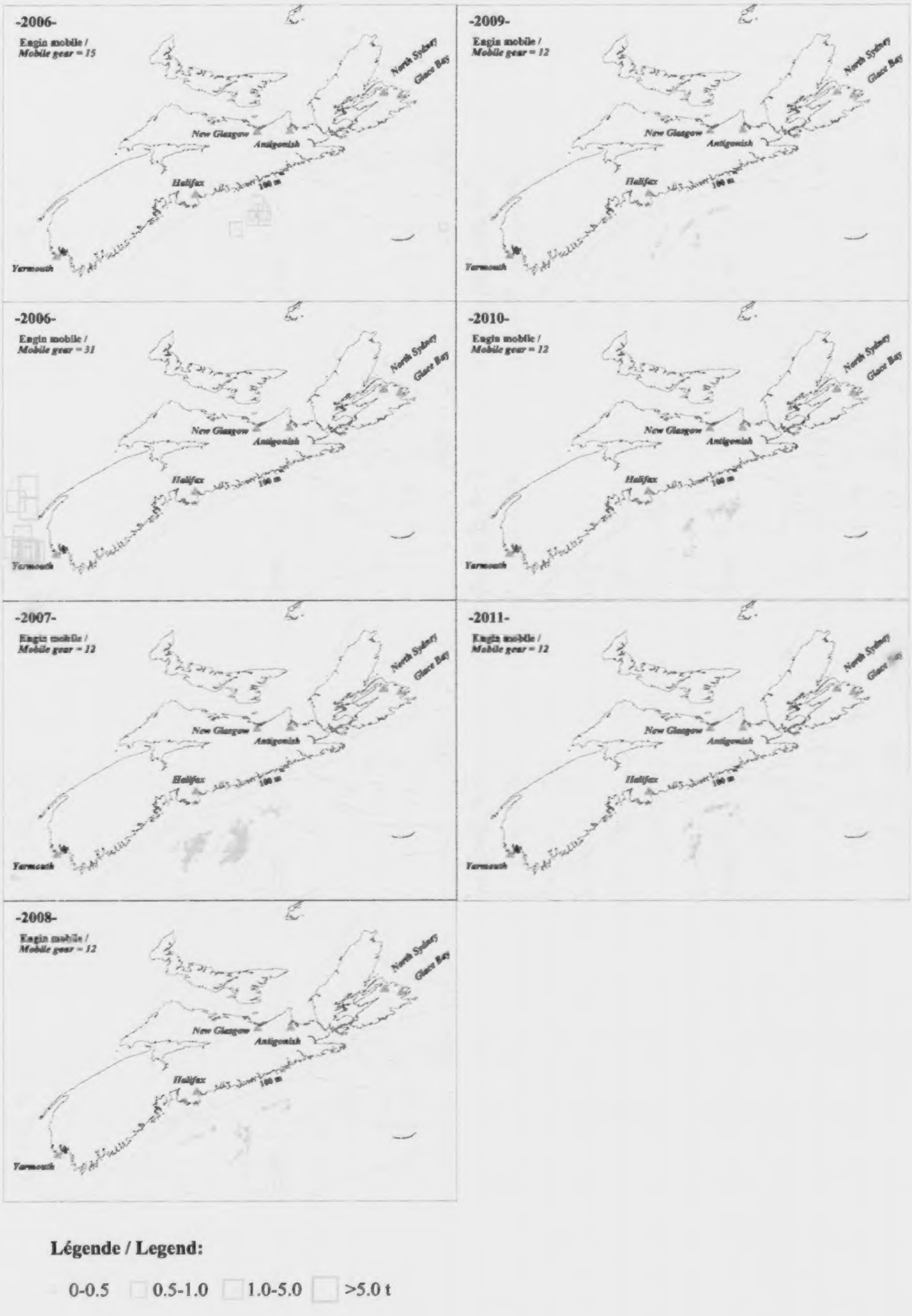

-2006-
Engin mobile /
Mobile gear = 15
-2009-
Engin mobile /
Mobile gear = 12
-2006-
Engin mobile /
Mobile gear = 31
-2010-
Engin mobile /
Mobile gear = 12
-2007-
Engin mobile /
Mobile gear = 12
-2011-
Engin mobile /
Mobile gear = 12
-2008-
Engin mobile /
Mobile gear = 12
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
100 m
Yarmouth
Légende / Legend:
0-0.5
0.5-1.0
1.0-5.0
>5.0 t

Figure 34. (Continued).

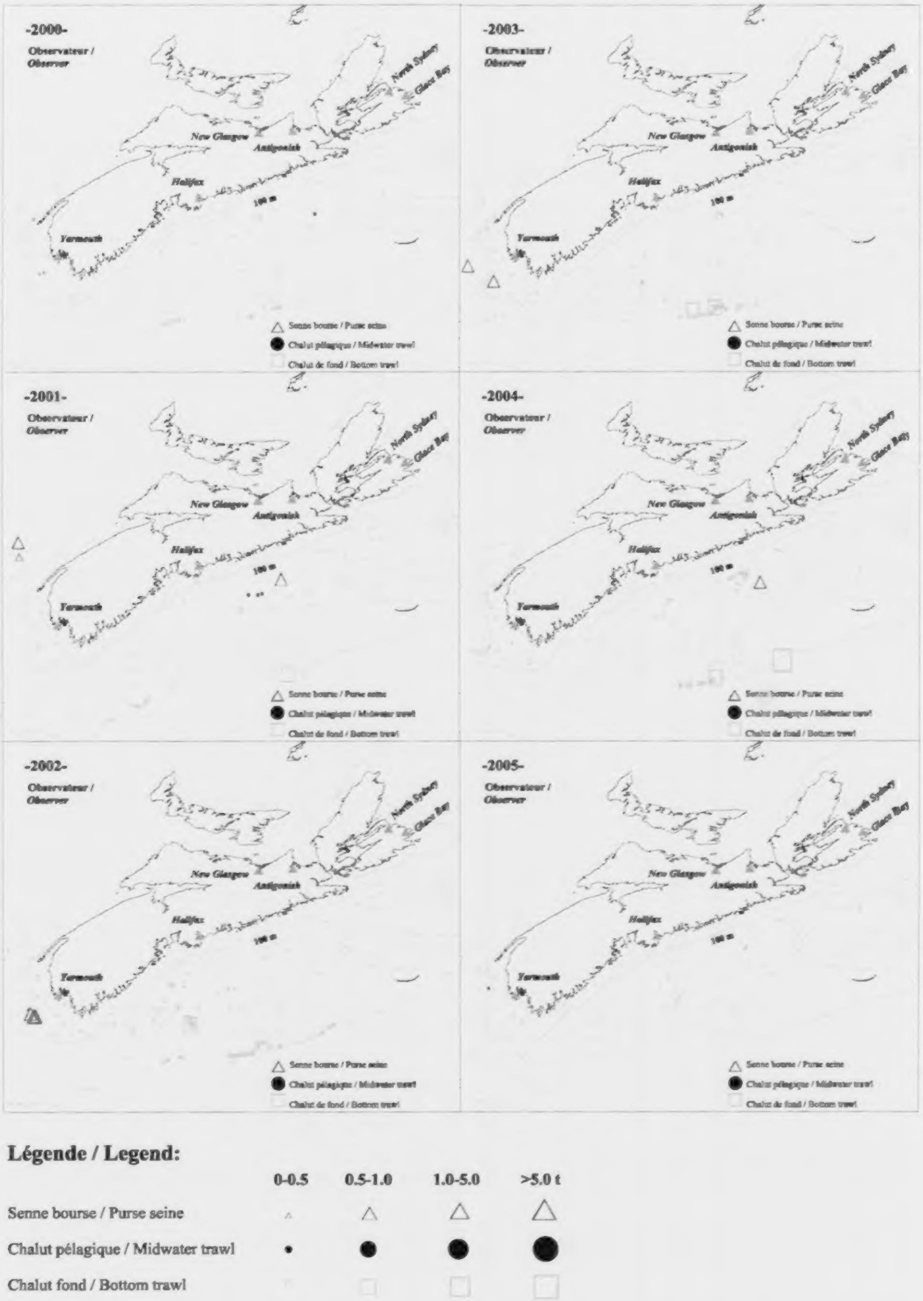
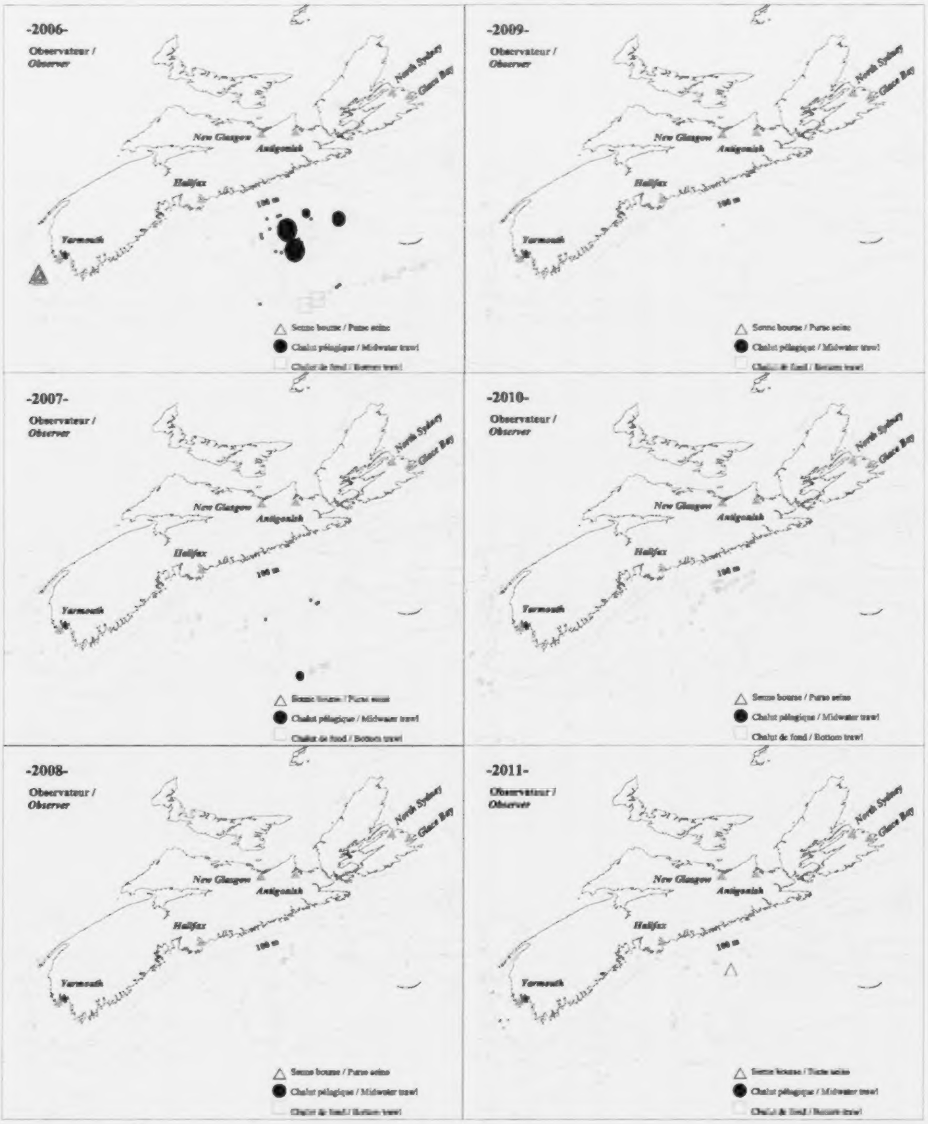

-2000-
Observateur / Observer
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
Yarmouth
100 m
Senne bourse / Purse seine
Chalut pélagique / Midwater trawl
Chalut de fond / Bottom trawl
-2003-
-2001-
-2004-
-2002-
-2005-
Légende / Legend:
0-0.5
0.5-1.0
1.0-5.0
>5.0 t
Senne bourse / Purse seine
Chalut pélagique / Midwater trawl
Chalut fond / Bottom trawl

Figure 35. Atlantic mackerel catches (t) locations by mobile gear in Nova Scotia from 2000 to 2011 (source : Nova Scotia Observer Program).


-2006-
Observateur / Observer
-2009-
Observateur / Observer
-2007-
Observateur / Observer
-2010-
Observateur / Observer
-2008-
Observateur / Observer
-2011-
Observateur / Observer
North Sydney
Glace Bay
New Glasgow
Antigonish
Halifax
Yarmouth
100 m
Senne bourse / Purse seine
Chalut pélagique / Midwater trawl
Chalut de fond / Bottom trawl

Légende / Legend:

	0-0.5	0.5-1.0	1.0-5.0	>5.0 t
Senne bourse / Purse seine	△	△	△	△
Chalut pélagique / Midwater trawl	●	●	●	●
Chalut fond / Bottom trawl	□	□	□	□

Figure 35. (Continued).

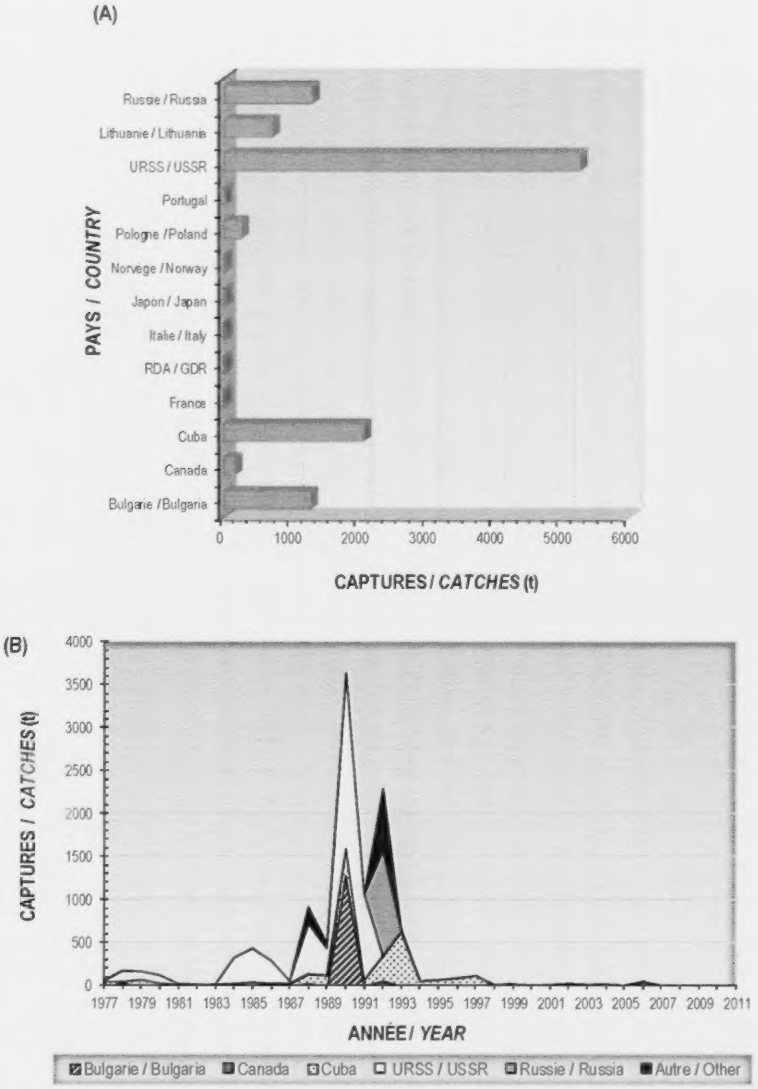


Figure 36. Total Atlantic mackerel catches (t) by country of origin (A) and year (B) from the data of the Nova Scotia Observer Program for the 1977-2011 period.

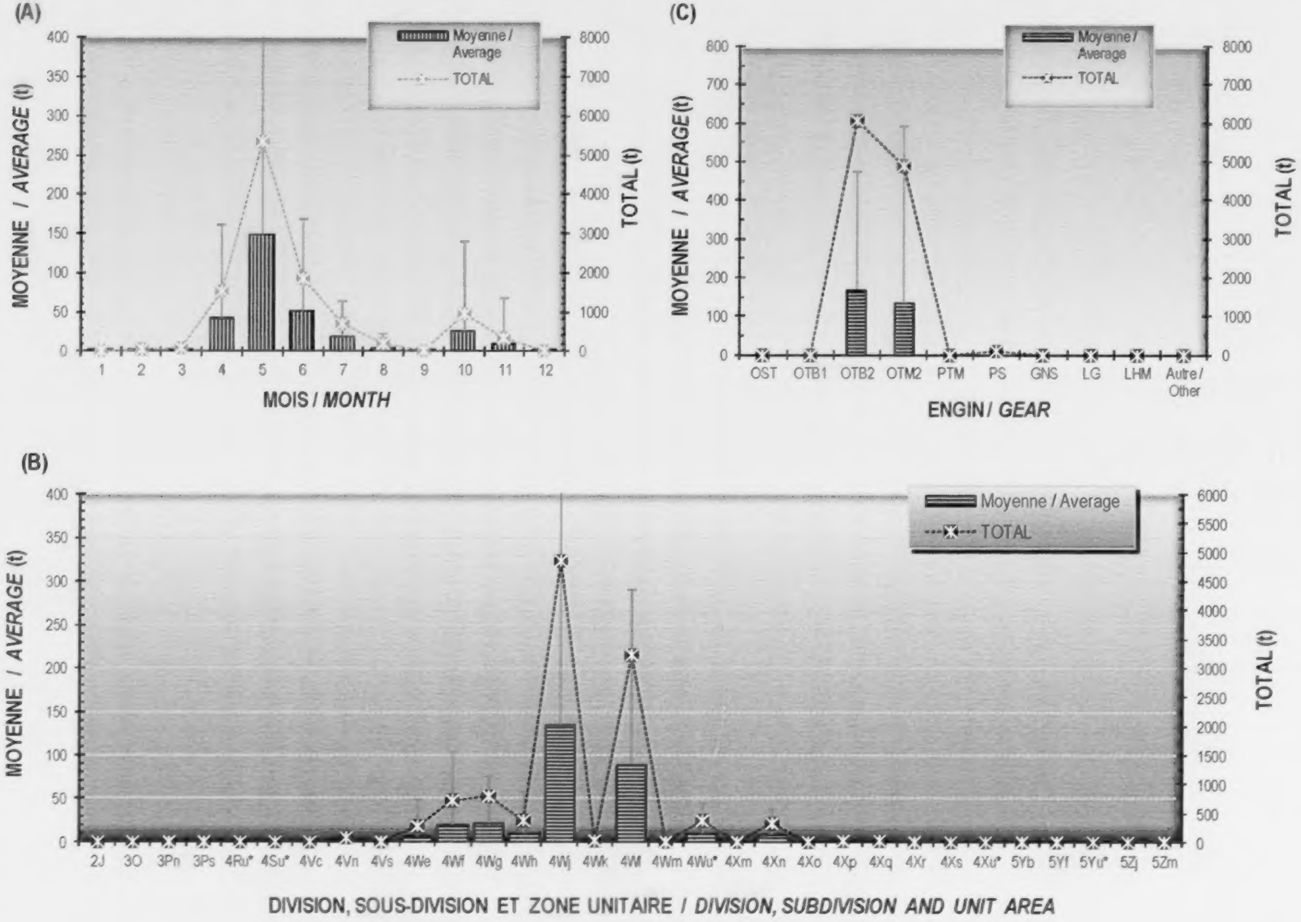


Figure 37. Total and average catches (t) of Atlantic mackerel by month (A), Division, subdivision and unit area (B) and by fishing gear (C) from the data of the Nova Scotia Observer Program for the 1977-2011 period (see Table 13 for the gear codes).

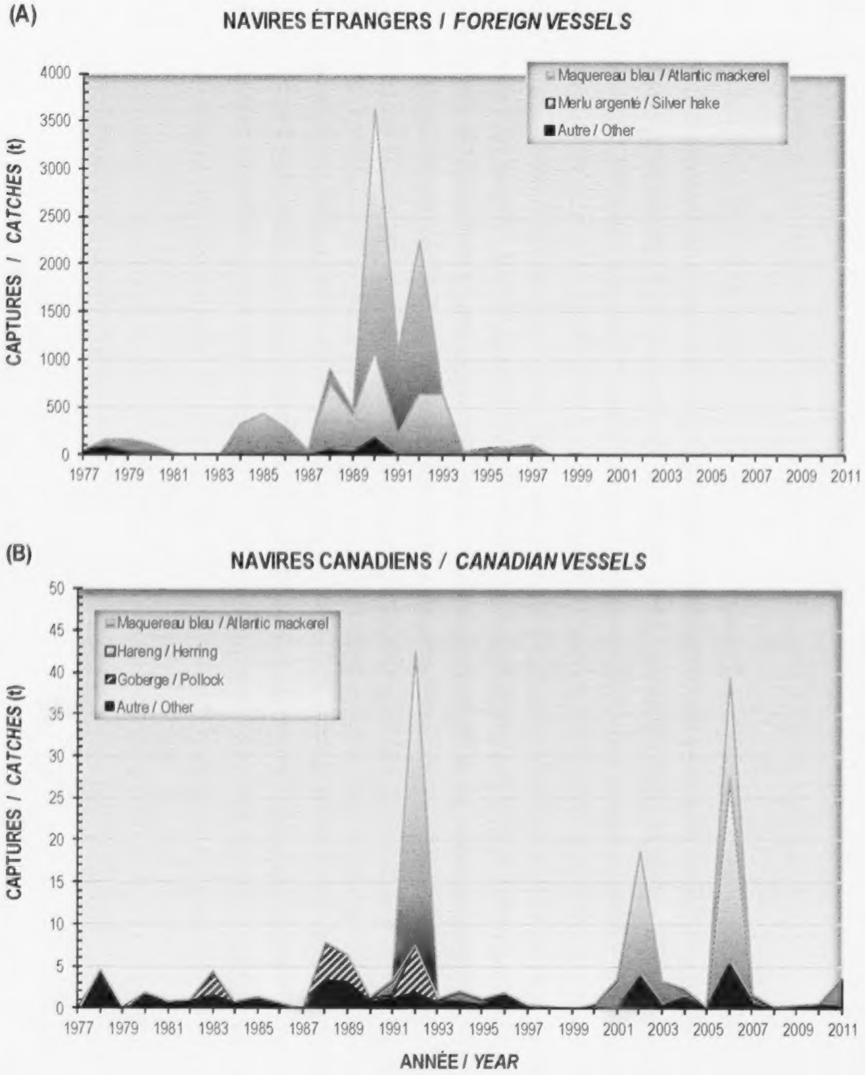


Figure 38. Total catches (t) of Atlantic mackerel by species sought for the foreign (A) and Canadian (B) vessels covered by the Nova Scotia Observer Program for the 1977-2011 period.

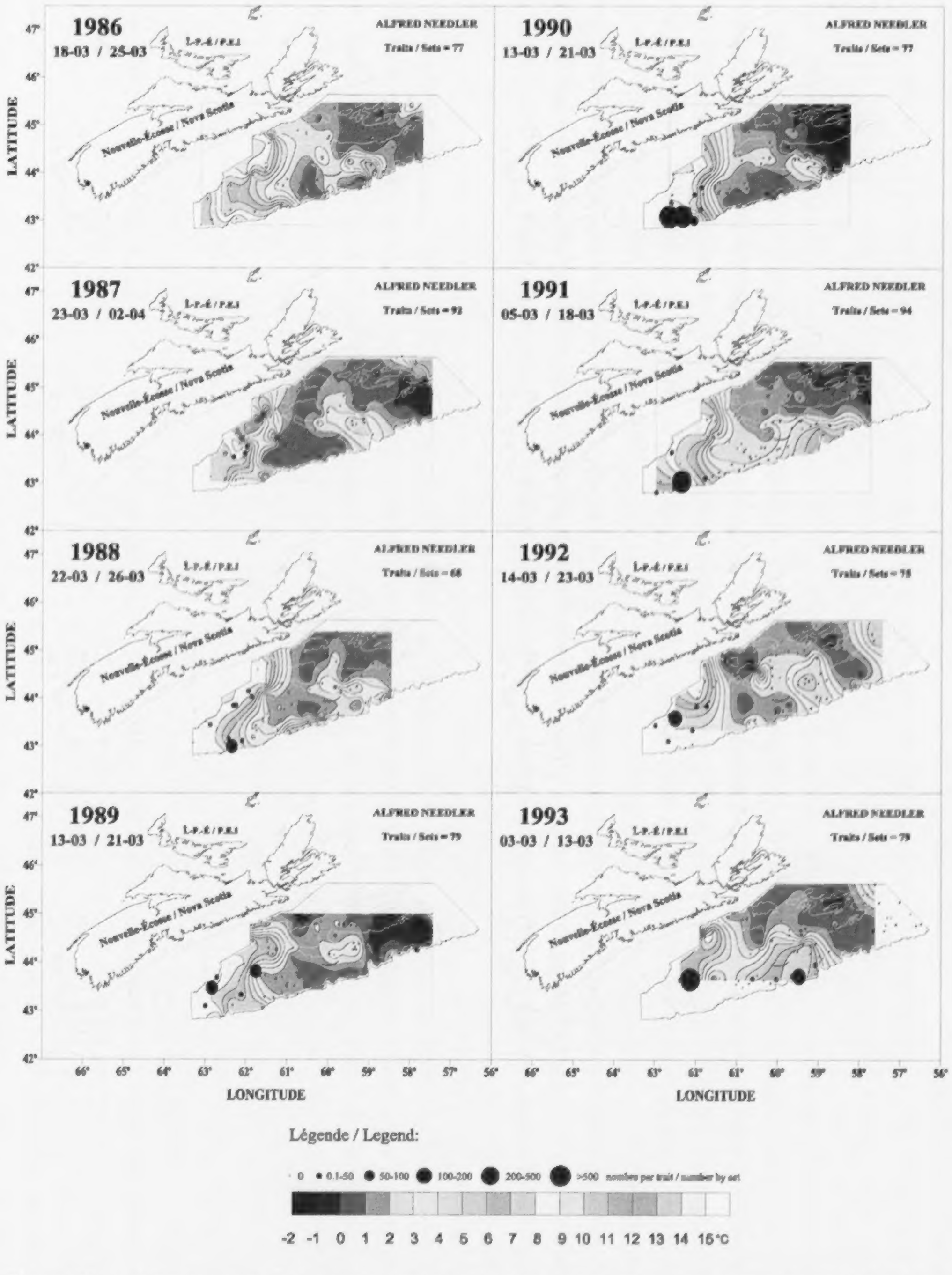

1986
18-03 / 25-03
1990
13-03 / 21-03
1987
23-03 / 02-04
1991
05-03 / 18-03
1988
22-03 / 26-03
1992
14-03 / 23-03
1989
13-03 / 21-03
1993
03-03 / 13-03
ALFRED NEEDLER
Traits / Sets = 77
Traits / Sets = 77
Traits / Sets = 92
Traits / Sets = 94
Traits / Sets = 68
Traits / Sets = 75
Traits / Sets = 79
Traits / Sets = 79
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
LONGITUDE
47°
46°
45°
44°
43°
42°
66°
65°
64°
63°
62°
61°
60°
59°
58°
57°
56°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre per trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15°C

Figure 39. *Atlantic mackerel catch rates (number by set) and bottom temperature (°C) of the winter cod assessment survey in NAFO Divisions 4VW for the 1986-2010 period.*

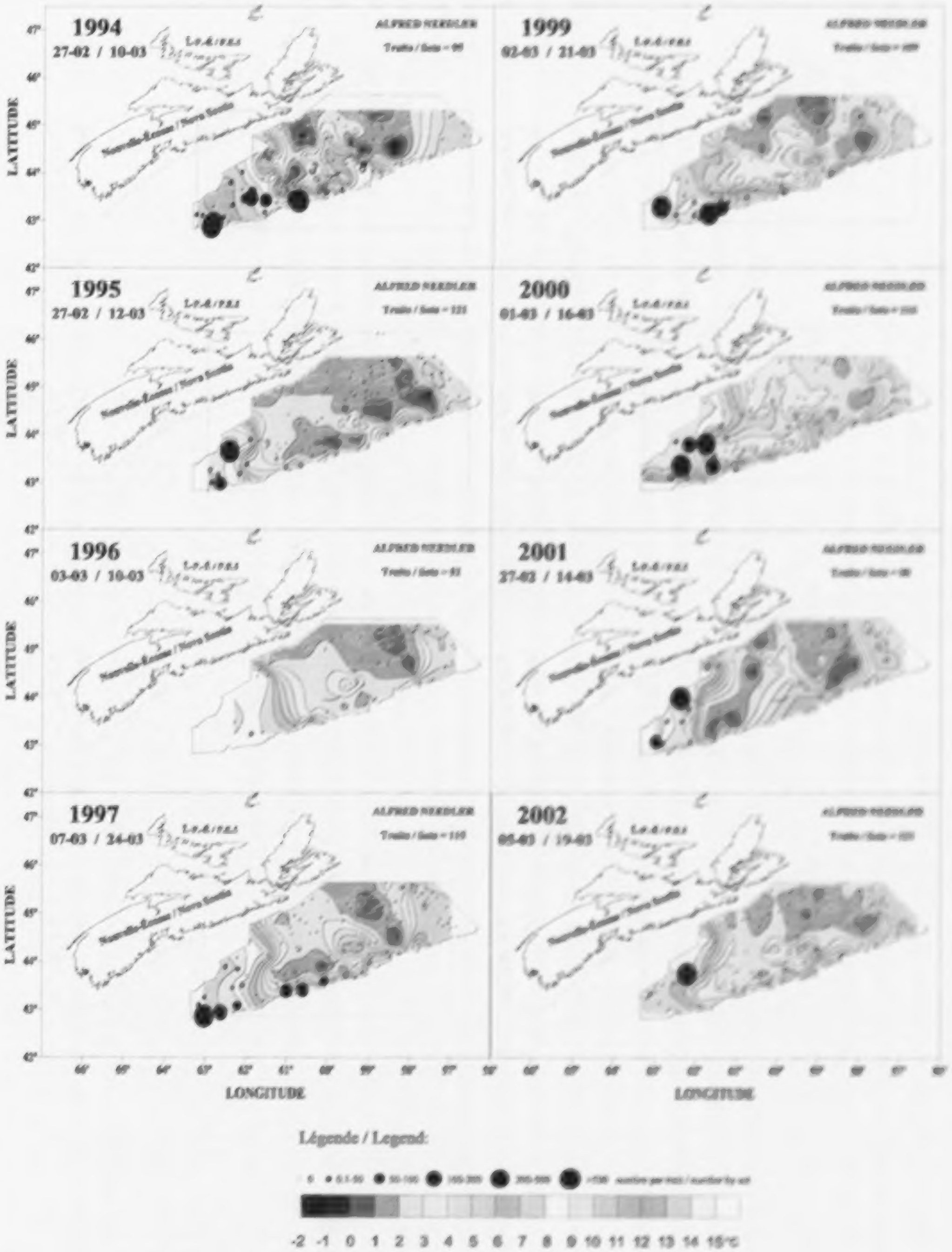

1994
27-02 / 10-03
1999
02-03 / 21-03
1995
27-02 / 12-03
2000
01-03 / 16-03
1996
03-03 / 10-03
2001
27-02 / 14-03
1997
07-03 / 24-03
2002
05-03 / 19-03
LATITUDE
LONGITUDE
Légende / Legend:
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15°C

Figure 39. *(Continued).*

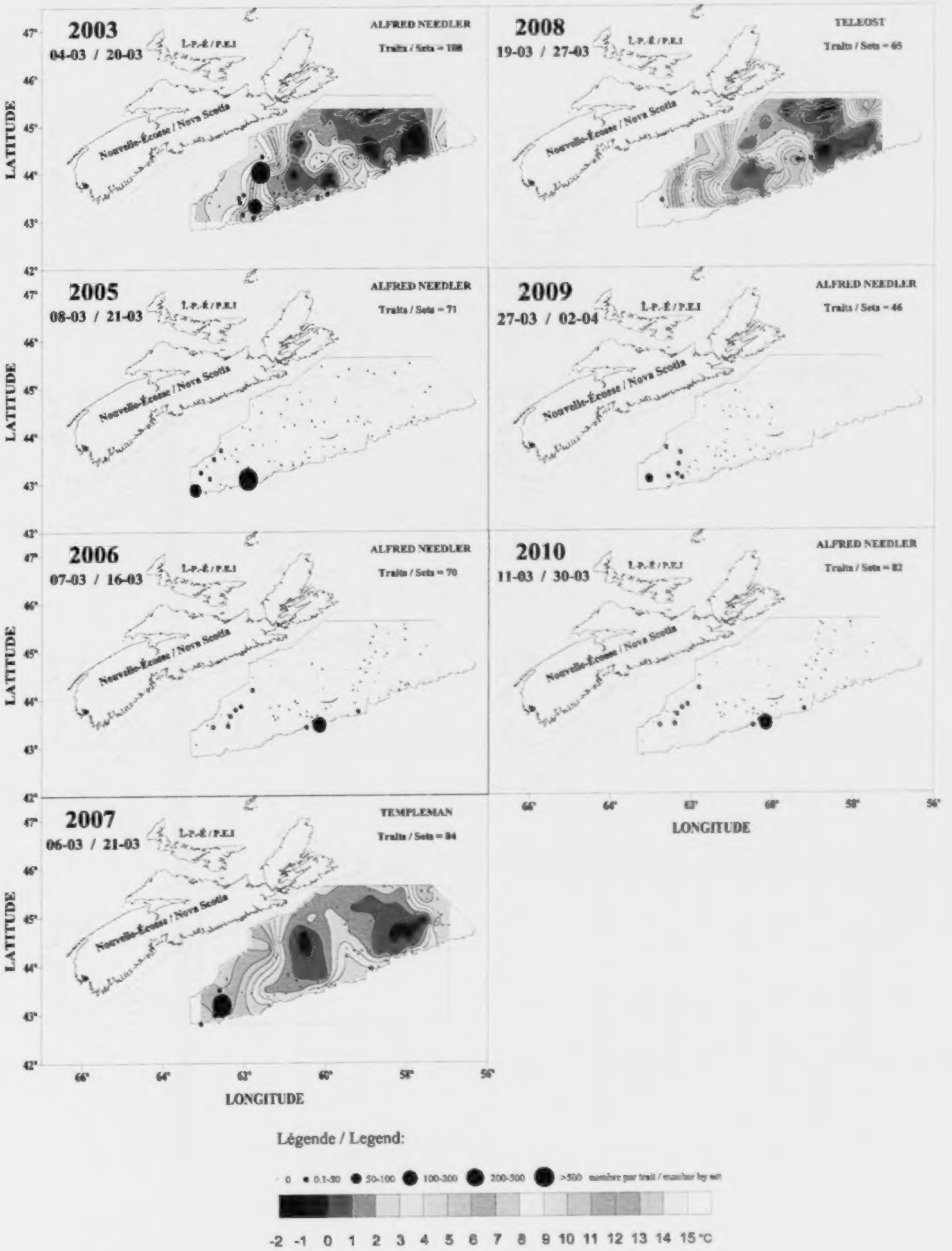

2003
04-03 / 20-03
ALFRED NEEDLER
Traits / Sets = 108
2008
19-03 / 27-03
TELEOST
Traits / Sets = 65
2005
08-03 / 21-03
ALFRED NEEDLER
Traits / Sets = 71
2009
27-03 / 02-04
ALFRED NEEDLER
Traits / Sets = 46
2006
07-03 / 16-03
ALFRED NEEDLER
Traits / Sets = 70
2010
11-03 / 30-03
ALFRED NEEDLER
Traits / Sets = 82
2007
06-03 / 21-03
TEMPLEMAN
Traits / Sets = 84
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
47°
46°
45°
44°
43°
42°
LONGITUDE
66°
64°
62°
60°
58°
56°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15 °C

Figure 39. (Continued).

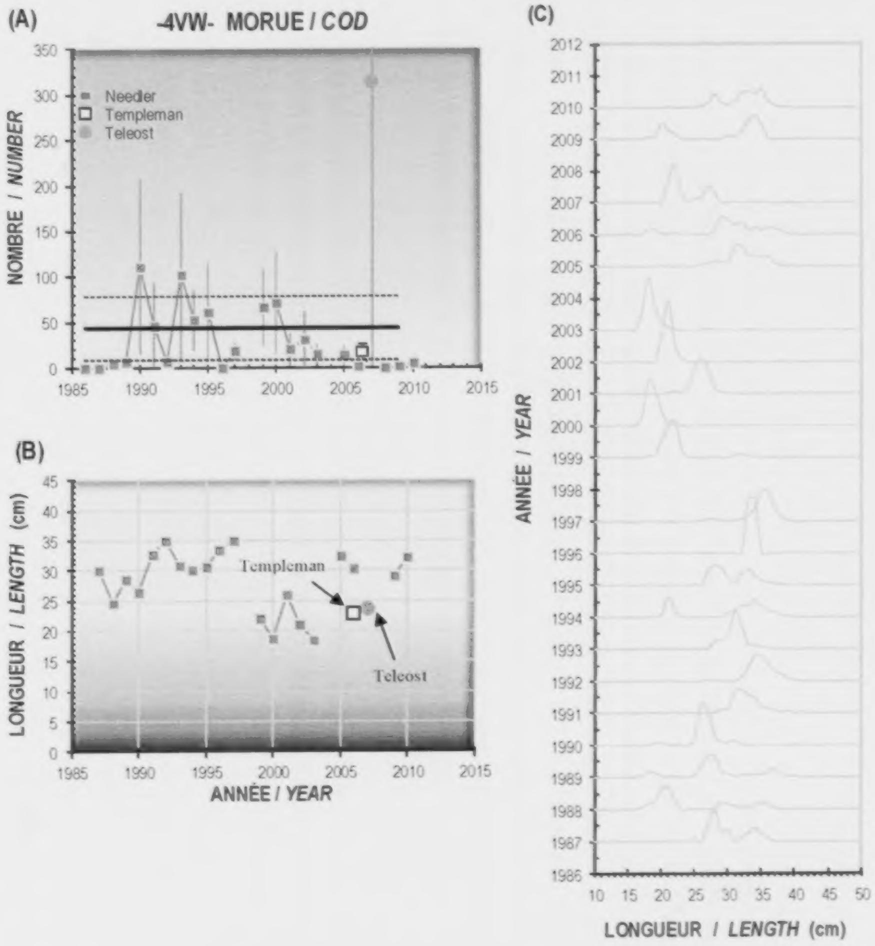


Figure 40. Mean number of Atlantic mackerel per set (A), mean length (cm) (B), and length frequencies (cm) (C) of the winter cod assessment survey in NAFO Divisions 4VW for the 1986-2010 period (horizontal lines in A represent the average of the 1986-2009 period ± 0.5 standard deviation).

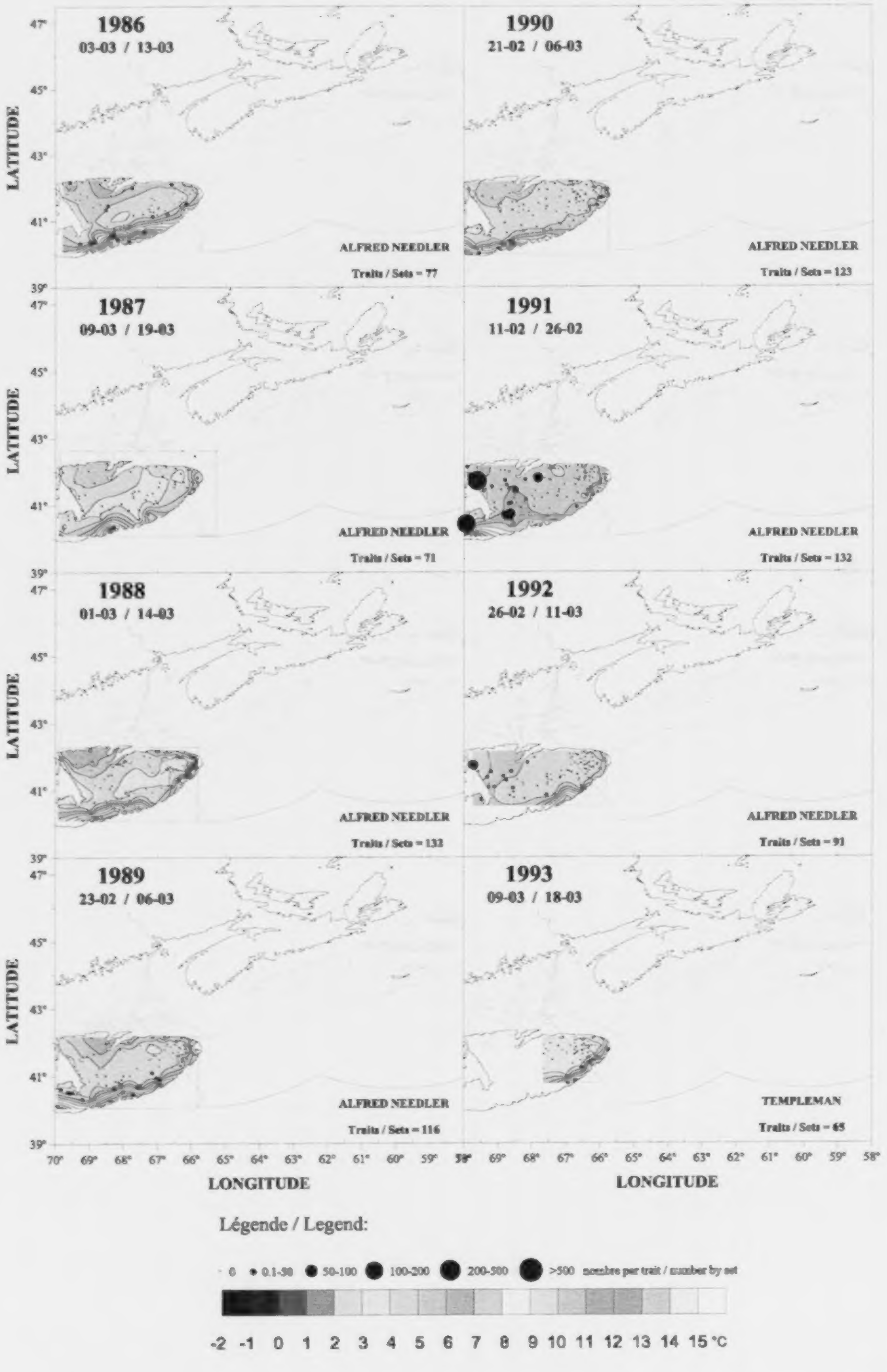

1986
03-03 / 13-03
ALFRED NEEDLER
Traits / Sets = 77
1990
21-02 / 06-03
ALFRED NEEDLER
Traits / Sets = 123
1987
09-03 / 19-03
ALFRED NEEDLER
Traits / Sets = 71
1991
11-02 / 26-02
ALFRED NEEDLER
Traits / Sets = 132
1988
01-03 / 14-03
ALFRED NEEDLER
Traits / Sets = 133
1992
26-02 / 11-03
ALFRED NEEDLER
Traits / Sets = 91
1989
23-02 / 06-03
ALFRED NEEDLER
Traits / Sets = 116
1993
09-03 / 18-03
TEMPLEMAN
Traits / Sets = 65
LATITUDE
47°
45°
43°
41°
39°
LONGITUDE
70° 69° 68° 67° 66° 65° 64° 63° 62° 61° 60° 59° 58°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500 nombre par trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 41. *Atlantic mackerel catch rates (number by set) and bottom temperature (°C) of the Georges Bank assessment survey for the 1986-2011 period.*

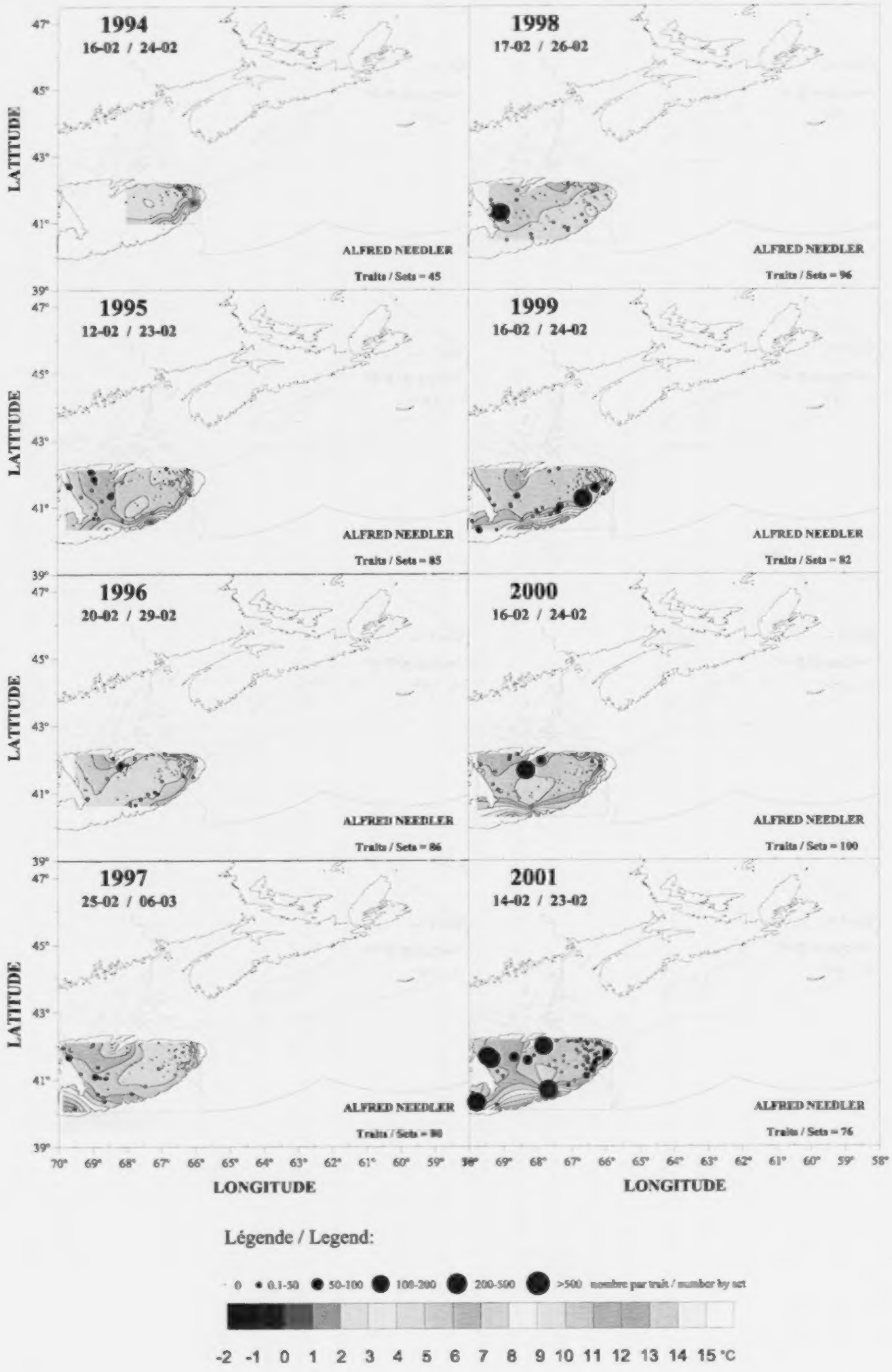

1994
16-02 / 24-02
ALFRED NEEDLER
Traits / Sets = 45
1998
17-02 / 26-02
ALFRED NEEDLER
Traits / Sets = 96
1995
12-02 / 23-02
ALFRED NEEDLER
Traits / Sets = 85
1999
16-02 / 24-02
ALFRED NEEDLER
Traits / Sets = 82
1996
20-02 / 29-02
ALFRED NEEDLER
Traits / Sets = 86
2000
16-02 / 24-02
ALFRED NEEDLER
Traits / Sets = 100
1997
25-02 / 06-03
ALFRED NEEDLER
Traits / Sets = 80
2001
14-02 / 23-02
ALFRED NEEDLER
Traits / Sets = 76
LATITUDE
47°
45°
43°
41°
39°
70° 69° 68° 67° 66° 65° 64° 63° 62° 61° 60° 59° 58°
LONGITUDE
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 41. *(Continued).*

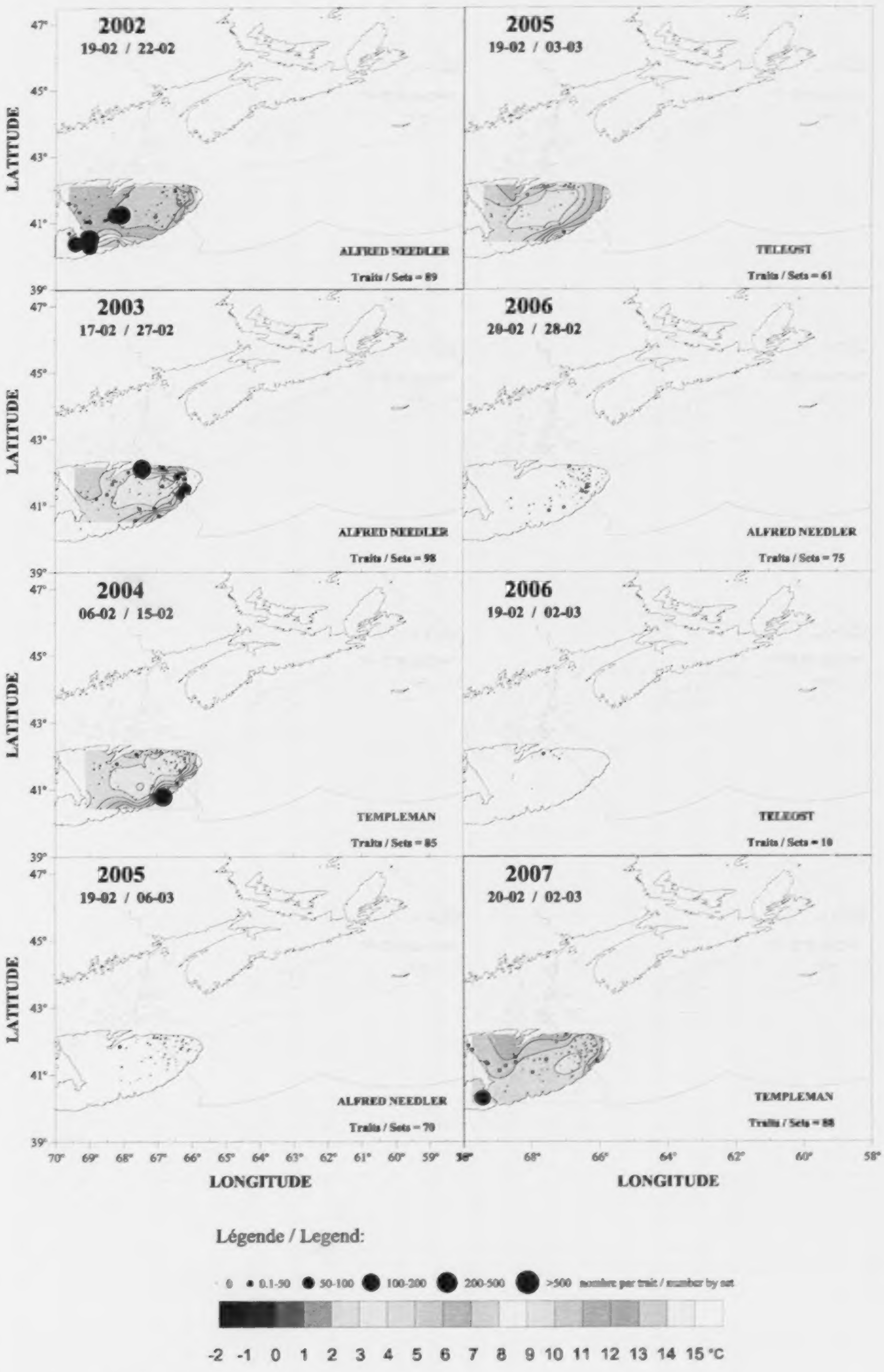

2002
19-02 / 22-02
ALFRED NEEDLER
Traits / Sets = 89
2005
19-02 / 03-03
TELEOST
Traits / Sets = 61
2003
17-02 / 27-02
ALFRED NEEDLER
Traits / Sets = 98
2006
20-02 / 28-02
ALFRED NEEDLER
Traits / Sets = 75
2004
06-02 / 15-02
TEMPLEMAN
Traits / Sets = 85
2006
19-02 / 02-03
TELEOST
Traits / Sets = 10
2005
19-02 / 06-03
ALFRED NEEDLER
Traits / Sets = 70
2007
20-02 / 02-03
TEMPLEMAN
Traits / Sets = 88
LATITUDE
47°
45°
43°
41°
39°
LONGITUDE
70°
69°
68°
67°
66°
65°
64°
63°
62°
61°
60°
59°
58°
LONGITUDE
68°
66°
64°
62°
60°
58°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 41. (Continued).

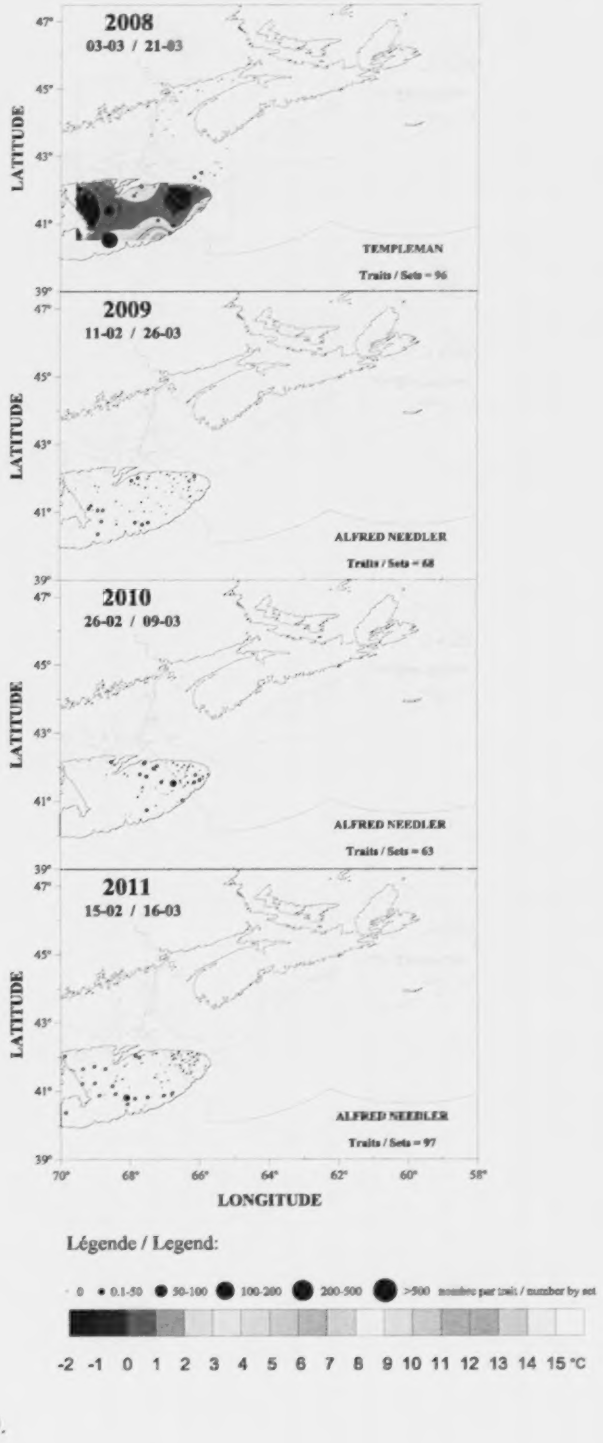

2008
03-03 / 21-03
TEMPLEMAN
Traits / Sets = 96
2009
11-02 / 26-03
ALFRED NEEDLER
Traits / Sets = 68
2010
26-02 / 09-03
ALFRED NEEDLER
Traits / Sets = 63
2011
15-02 / 16-03
ALFRED NEEDLER
Traits / Sets = 97
LATITUDE
47°
45°
43°
41°
39°
70°
68°
66°
64°
62°
60°
58°
LONGITUDE
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 41. (Continued).

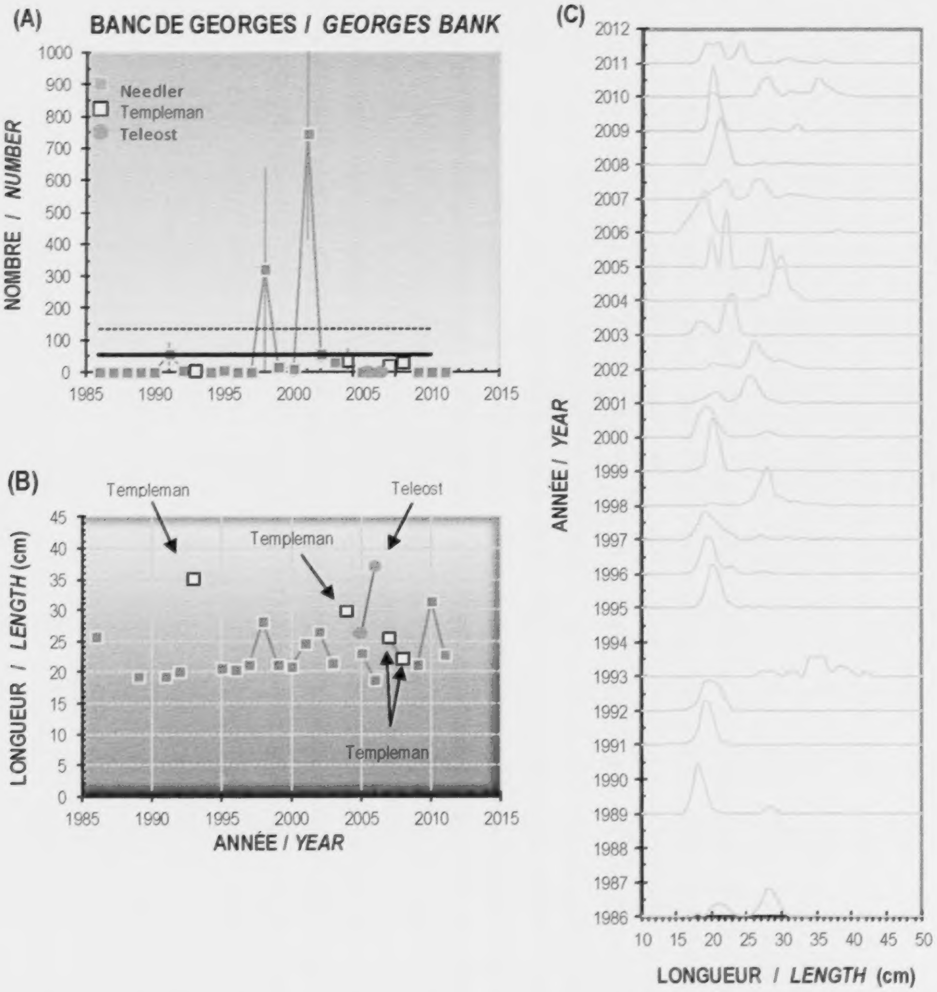
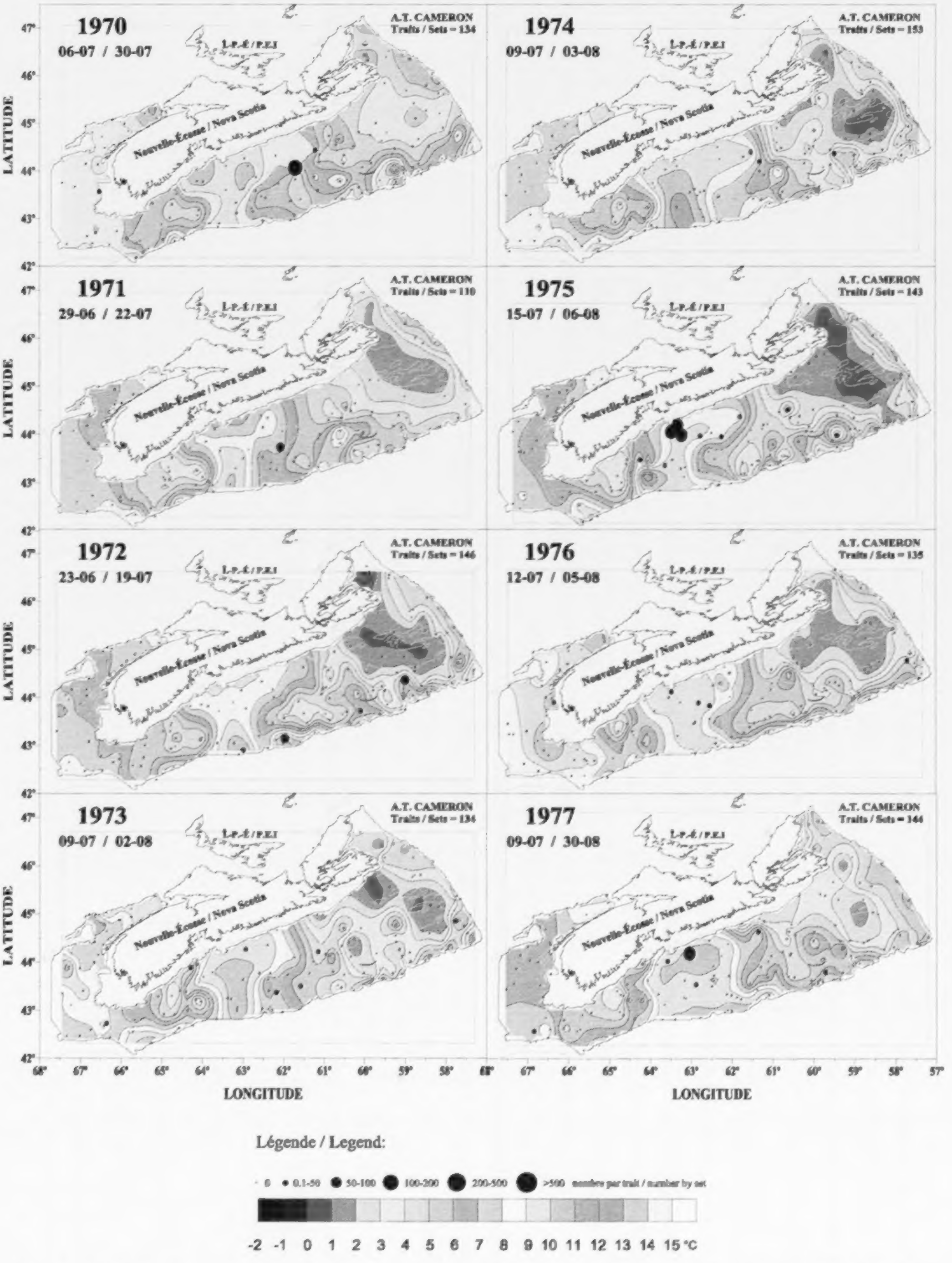
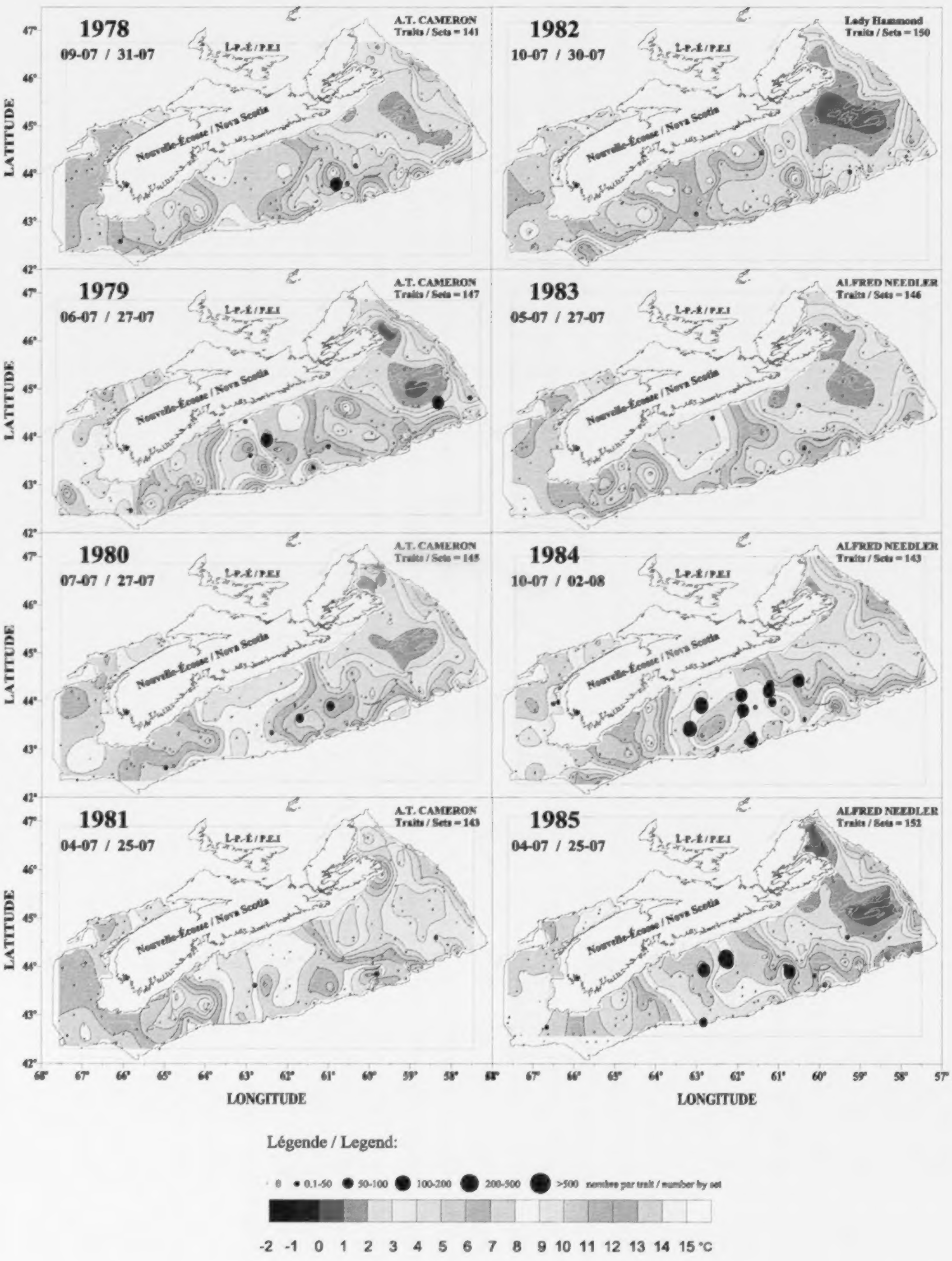


Figure 42. Mean number of Atlantic mackerel per set (A), mean length (cm) (B), and length frequencies (cm) (C) of the Georges Bank assessment survey for the 1986-2011 period (horizontal lines in A represent the average of the 1986-2010 period ± 0.5 standard deviation).



1970
06-07 / 30-07
A.T. CAMERON
Traits / Sets = 134
1974
09-07 / 03-08
A.T. CAMERON
Traits / Sets = 153
1971
29-06 / 22-07
A.T. CAMERON
Traits / Sets = 110
1975
15-07 / 06-08
A.T. CAMERON
Traits / Sets = 143
1972
23-06 / 19-07
A.T. CAMERON
Traits / Sets = 146
1976
12-07 / 05-08
A.T. CAMERON
Traits / Sets = 135
1973
09-07 / 02-08
A.T. CAMERON
Traits / Sets = 134
1977
09-07 / 30-08
A.T. CAMERON
Traits / Sets = 144
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
47°
46°
45°
44°
43°
42°
LONGITUDE
68°
67°
66°
65°
64°
63°
62°
61°
60°
59°
58°
57°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 43. Atlantic mackerel catch rates (number by set) and bottom temperature (°C) of the summer assessment survey in NAFO Divisions 4VWX for the 1970-2011 period.



1978
09-07 / 31-07
A.T. CAMERON
Traits / Sets = 141
1982
10-07 / 30-07
Lady Hammond
Traits / Sets = 150
1979
06-07 / 27-07
A.T. CAMERON
Traits / Sets = 147
1983
05-07 / 27-07
ALFRED NEEDLER
Traits / Sets = 146
1980
07-07 / 27-07
A.T. CAMERON
Traits / Sets = 145
1984
10-07 / 02-08
ALFRED NEEDLER
Traits / Sets = 143
1981
04-07 / 25-07
A.T. CAMERON
Traits / Sets = 143
1985
04-07 / 25-07
ALFRED NEEDLER
Traits / Sets = 152
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
42°
43°
44°
45°
46°
47°
LONGITUDE
68°
67°
66°
65°
64°
63°
62°
61°
60°
59°
58°
57°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15 °C

Figure 43. *(Continued).*

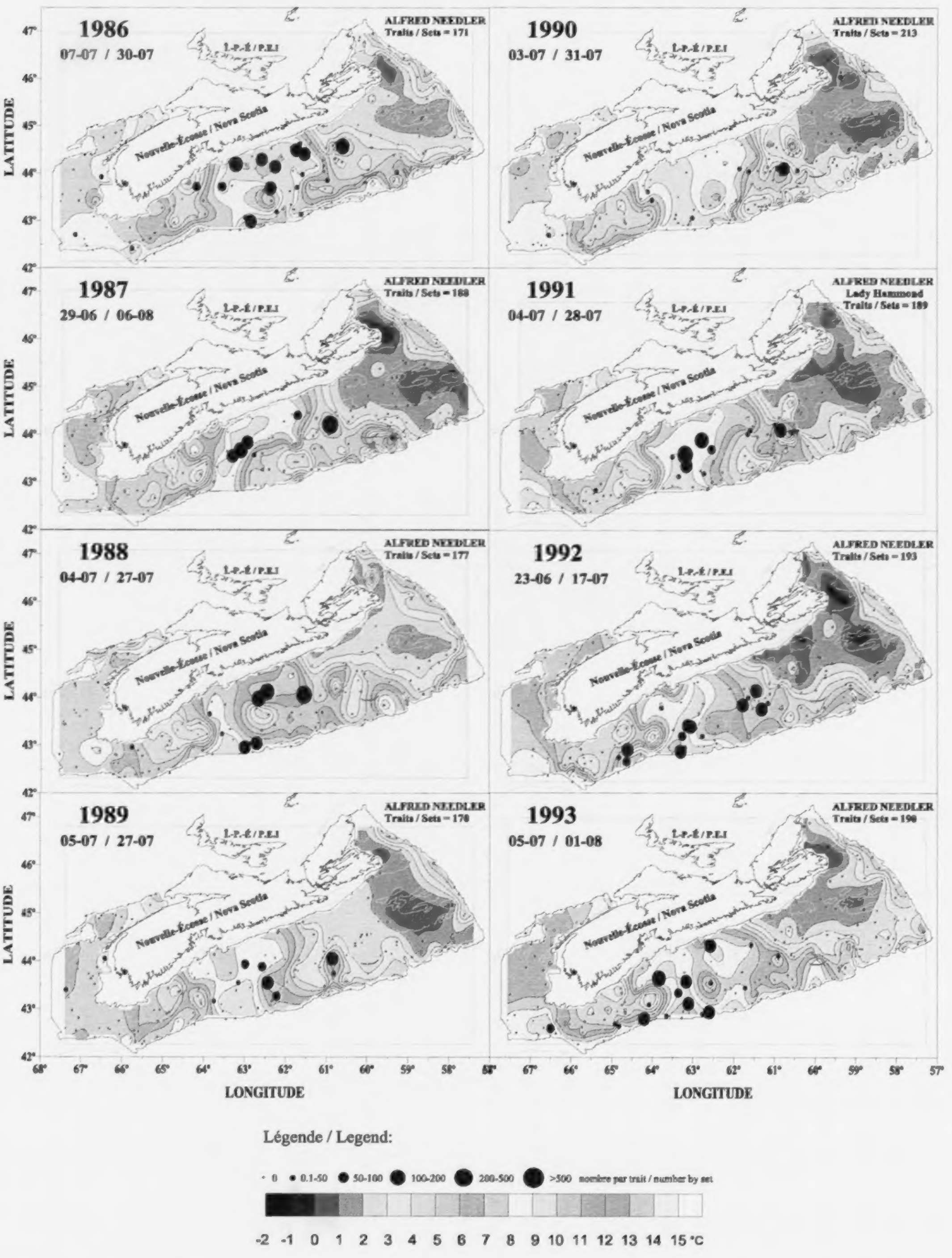

1986
07-07 / 30-07
ALFRED NEEDLER
Traits / Sets = 171
1990
03-07 / 31-07
ALFRED NEEDLER
Traits / Sets = 213
1987
29-06 / 06-08
ALFRED NEEDLER
Traits / Sets = 188
1991
04-07 / 28-07
ALFRED NEEDLER
Lady Hammond
Traits / Sets = 189
1988
04-07 / 27-07
ALFRED NEEDLER
Traits / Sets = 177
1992
23-06 / 17-07
ALFRED NEEDLER
Traits / Sets = 193
1989
05-07 / 27-07
ALFRED NEEDLER
Traits / Sets = 170
1993
05-07 / 01-08
ALFRED NEEDLER
Traits / Sets = 190
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
42°
43°
44°
45°
46°
47°
LONGITUDE
68°
67°
66°
65°
64°
63°
62°
61°
60°
59°
58°
57°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 43. (Continued).

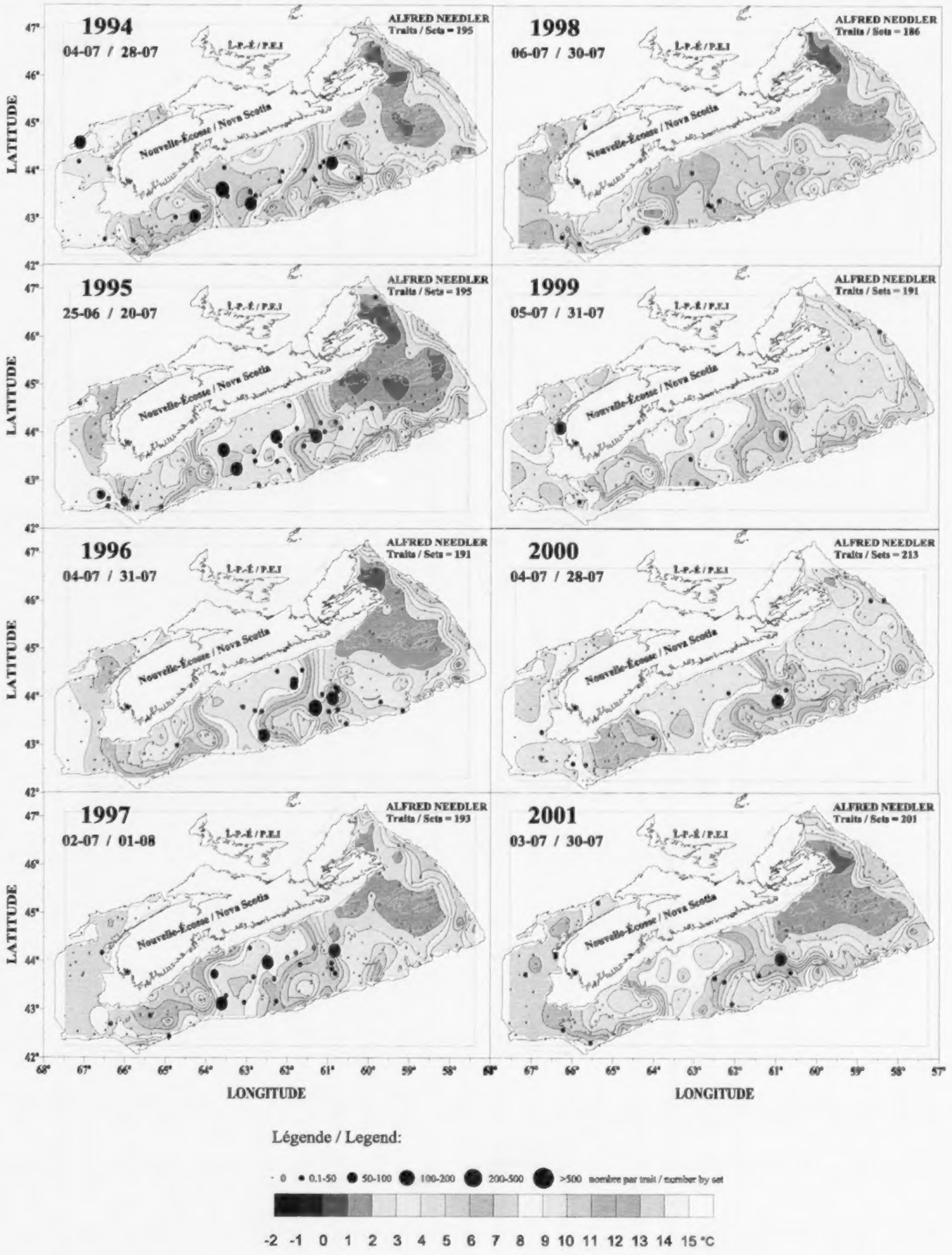

1994
04-07 / 28-07
ALFRED NEEDLER
Traits / Sets = 195
1995
25-06 / 20-07
ALFRED NEEDLER
Traits / Sets = 195
1996
04-07 / 31-07
ALFRED NEEDLER
Traits / Sets = 191
1997
02-07 / 01-08
ALFRED NEEDLER
Traits / Sets = 193
1998
06-07 / 30-07
ALFRED NEEDLER
Traits / Sets = 186
1999
05-07 / 31-07
ALFRED NEEDLER
Traits / Sets = 191
2000
04-07 / 28-07
ALFRED NEEDLER
Traits / Sets = 213
2001
03-07 / 30-07
ALFRED NEEDLER
Traits / Sets = 201
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
LONGITUDE
42°
43°
44°
45°
46°
47°
68°
67°
66°
65°
64°
63°
62°
61°
60°
59°
58°
57°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15 °C

Figure 43. *(Continued).*

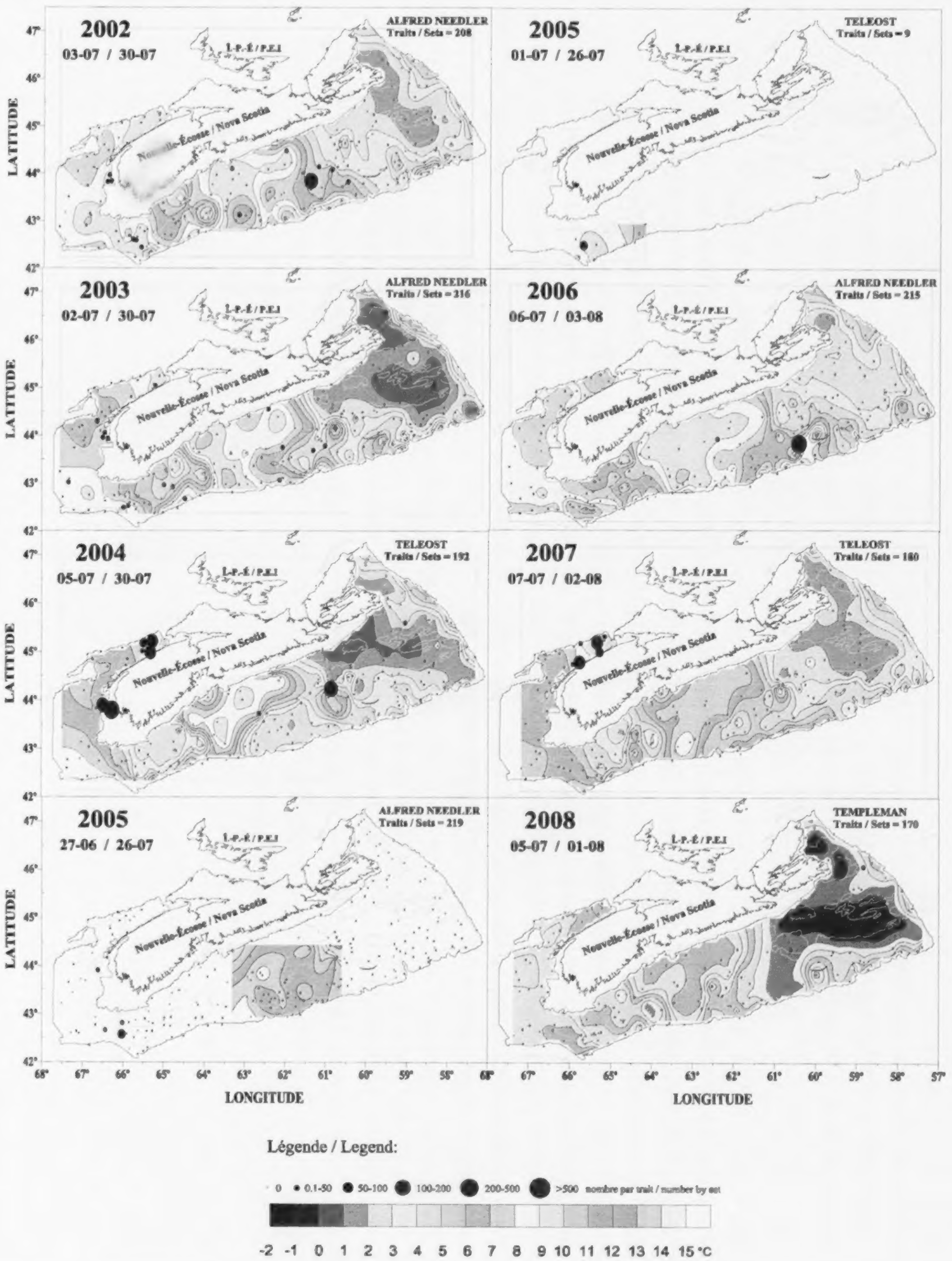
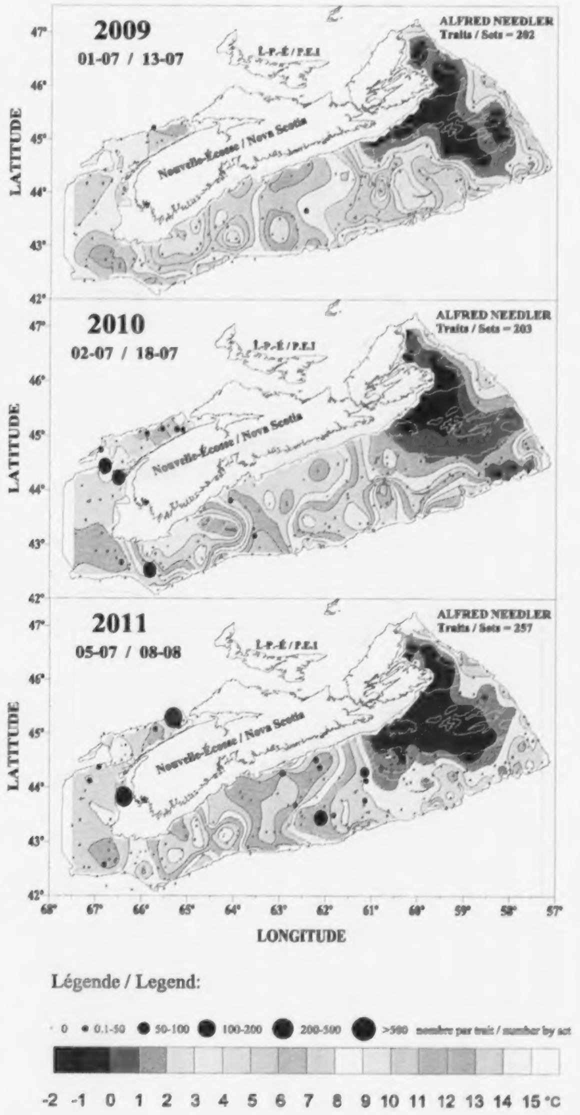

2002
03-07 / 30-07
ALFRED NEEDLER
Traits / Sets = 208
2005
01-07 / 26-07
TELEOST
Traits / Sets = 9
2003
02-07 / 30-07
ALFRED NEEDLER
Traits / Sets = 316
2006
06-07 / 03-08
ALFRED NEEDLER
Traits / Sets = 215
2004
05-07 / 30-07
TELEOST
Traits / Sets = 192
2007
07-07 / 02-08
TELEOST
Traits / Sets = 180
2005
27-06 / 26-07
ALFRED NEEDLER
Traits / Sets = 219
2008
05-07 / 01-08
TEMPLEMAN
Traits / Sets = 170
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
42°
43°
44°
45°
46°
47°
LONGITUDE
68°
67°
66°
65°
64°
63°
62°
61°
60°
59°
58°
57°
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2
-1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15 °C

Figure 43. (Continued).



2009
01-07 / 13-07
ALFRED NEEDLER
Traits / Sets = 202
Î.-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
2010
02-07 / 18-07
ALFRED NEEDLER
Traits / Sets = 203
2011
05-07 / 08-08
ALFRED NEEDLER
Traits / Sets = 257
LATITUDE
47°
46°
45°
44°
43°
42°
68°
67°
66°
65°
64°
63°
62°
61°
60°
59°
58°
57°
LONGITUDE
Légende / Legend:
0
0.1-50
50-100
100-200
200-500
>500
nombre par trait / number by set
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 43. *(Continued).*

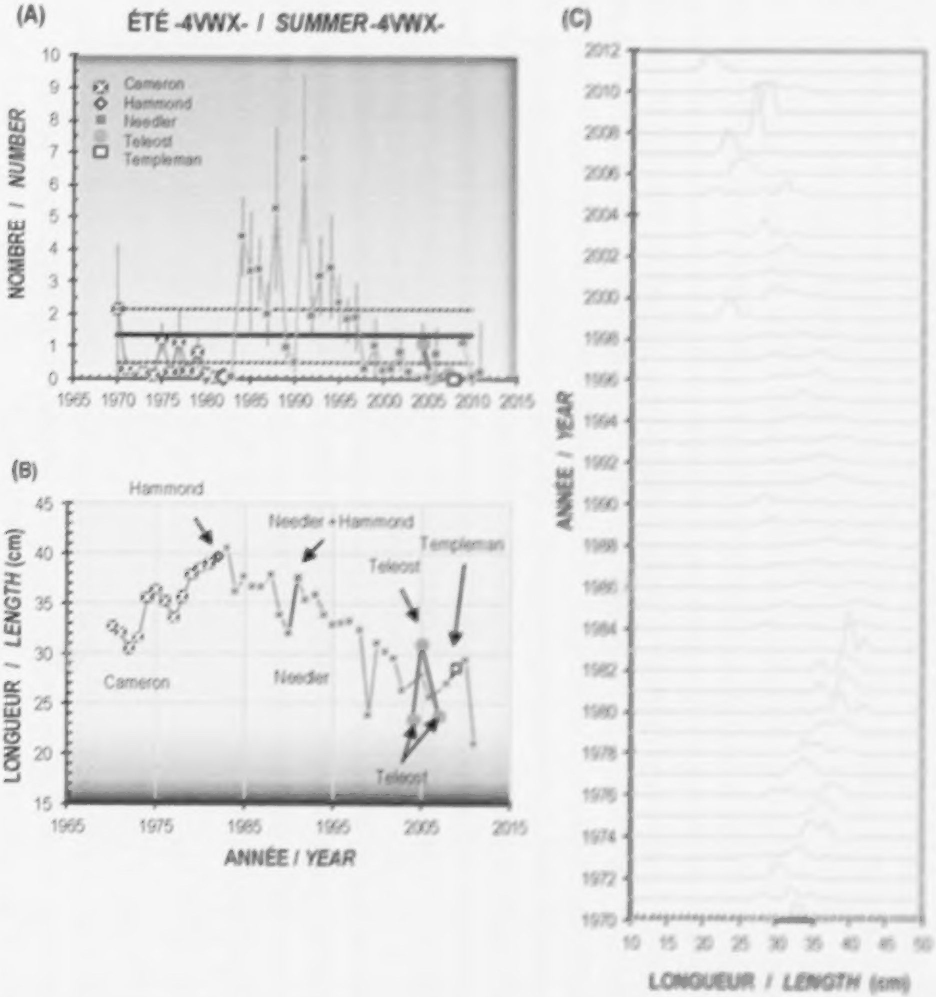


Figure 44. ***Mean number of Atlantic mackerel per set (A), mean length (cm) (B), and length frequencies (cm) (C) of the summer assessment survey of NAFO Divisions 4VWX for the 1970-2011 period (horizontal lines in A represent the average of the 1970-2010 period ± 0.5 standard deviation).***

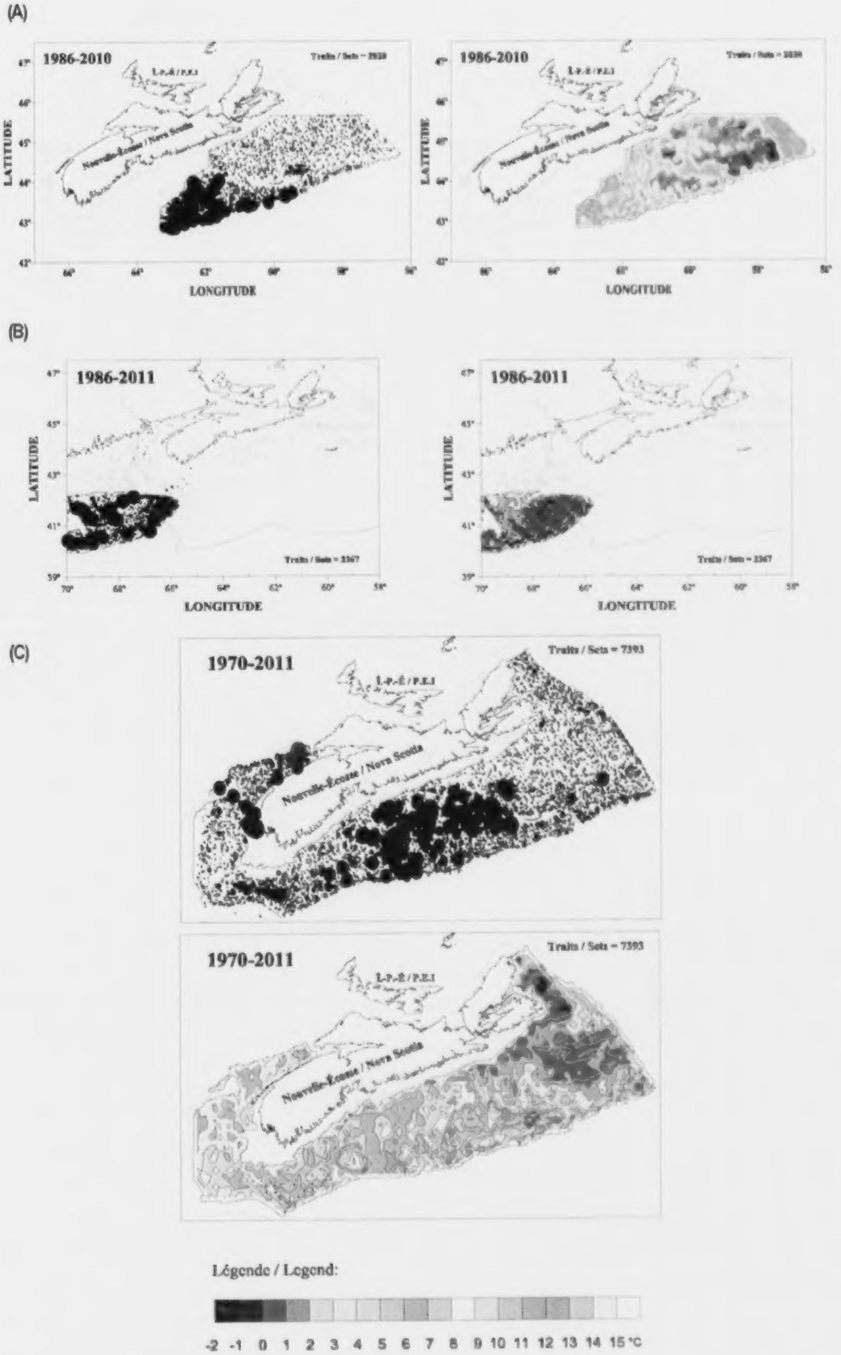

(A)
1986-2010
L-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
LATITUDE
LONGITUDE
1986-2010
LATITUDE
LONGITUDE
(B)
1986-2011
LATITUDE
LONGITUDE
Traits / Sets = 2367
1986-2011
LATITUDE
LONGITUDE
Traits / Sets = 2367
(C)
1970-2011
Traits / Sets = 7393
L-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
1970-2011
Traits / Sets = 7393
L-P.-É / P.E.I
Nouvelle-Écosse / Nova Scotia
Légende / Legend:
-2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 °C

Figure 45. *Composite maps of the Atlantic mackerel catch rates (number / set) and bottom temperature (°C) of the following surveys: (A) 4VW cod (1986-2010), (B) Georges Bank (1986-2011), and (C) summer 4VWX (1970-2011).*

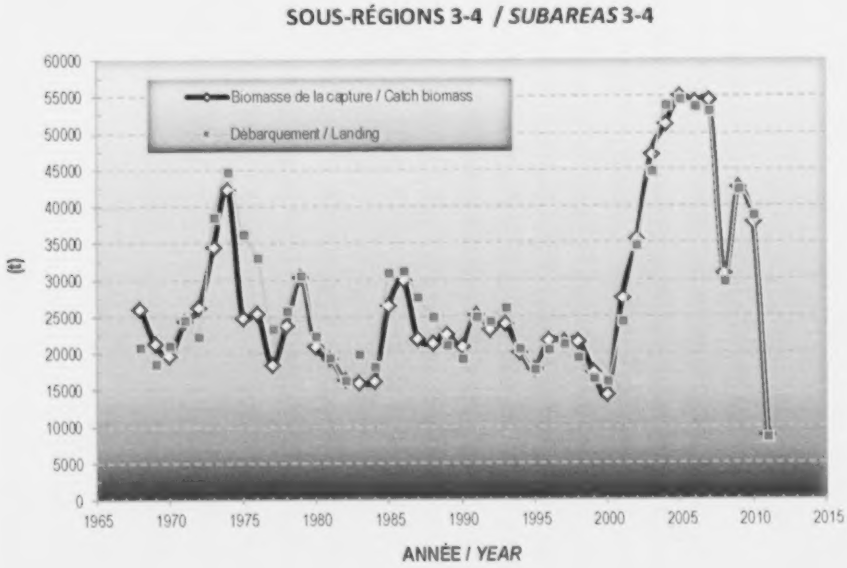


Figure 46. Landing (t) and catch biomass (t) of Atlantic mackerel in NAFO Subareas 3-4 since 1968.

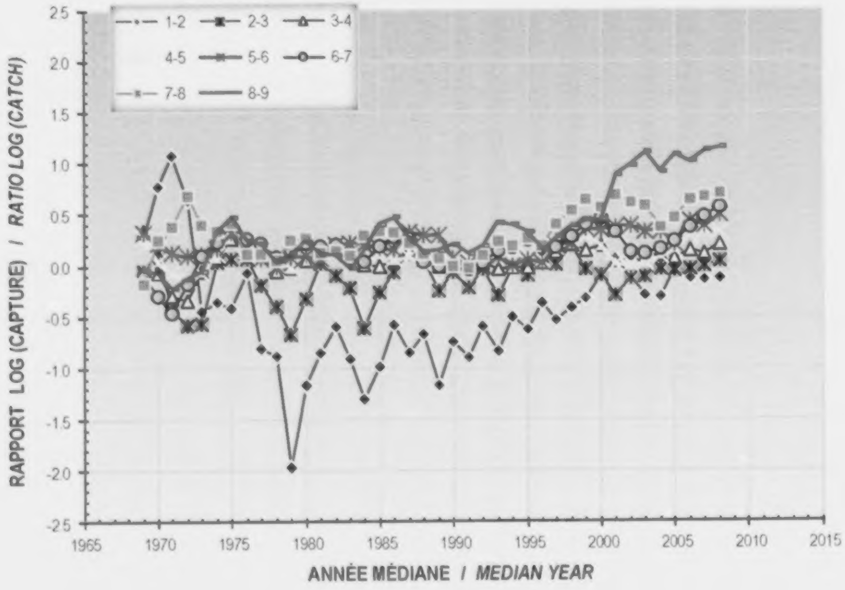


Figure 47. Ratio of the log of the catch at age (moving average of three years) of the Atlantic mackerel of NAFO Subareas 3-4.

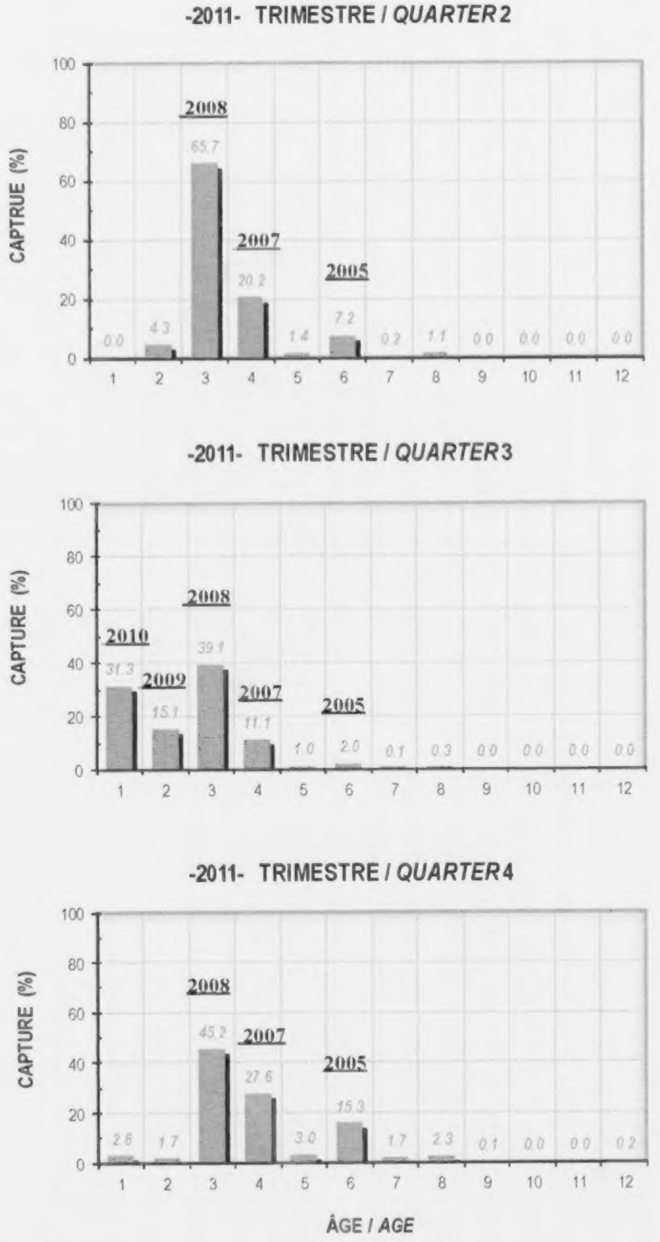


Figure 48. Atlantic mackerel catch at age (%) by quarter of NAFO Subareas 3-4 in 2011 (the most important year-classes are indicated).

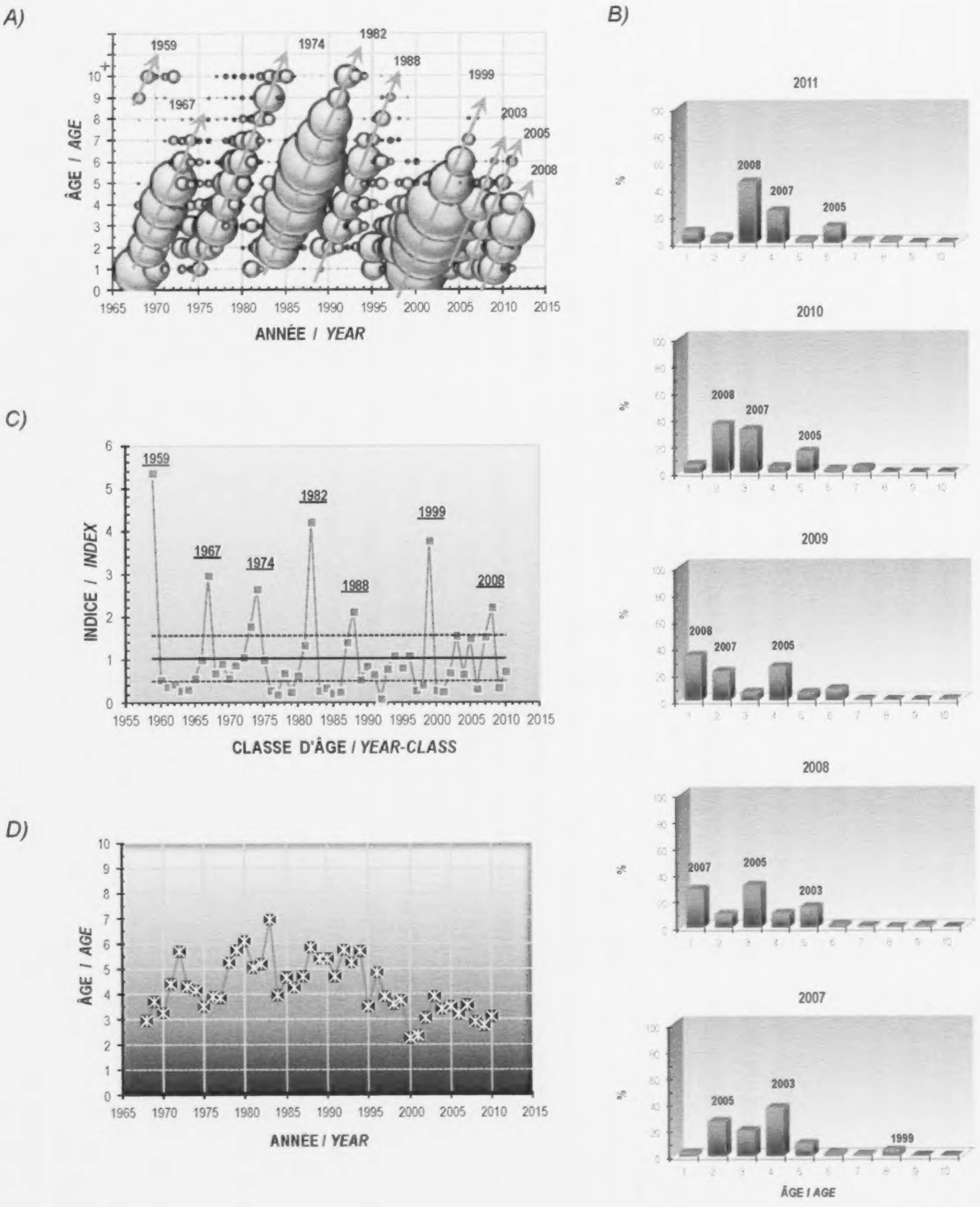


Figure 49. Catch at age in % (A and B) (dominant year-classes are indicated), Johnson's index showing the relative strength of the year-classes (horizontal lines represent the average of the 1959-2010 year-classes ± 0.5 standard deviation) (C) and mean age of the catch (D) of the Atlantic mackerel in NAFO Subareas 3-4.

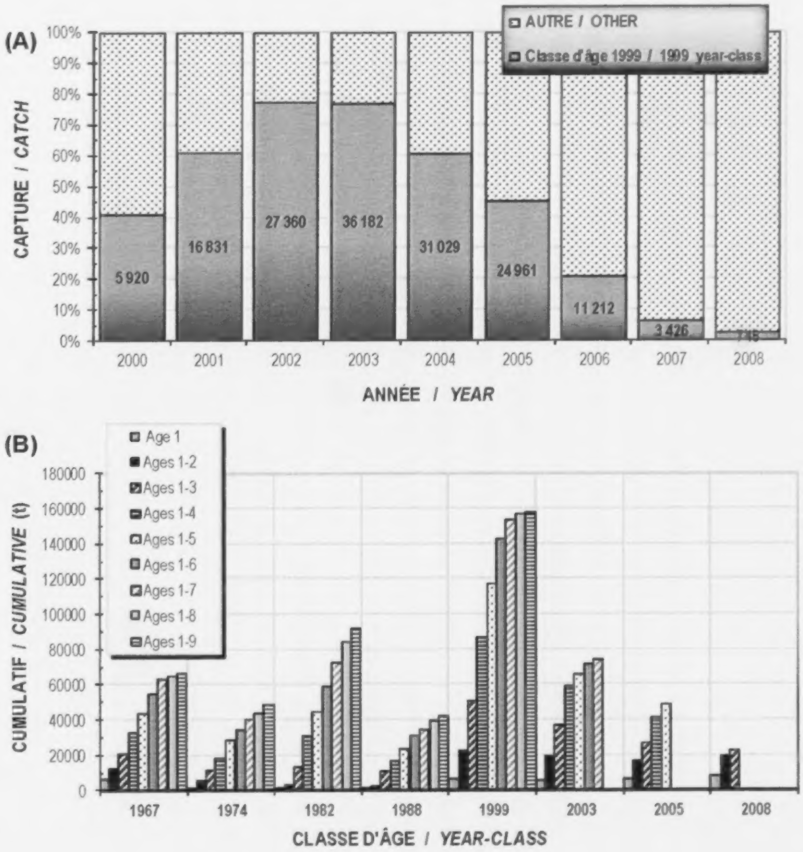
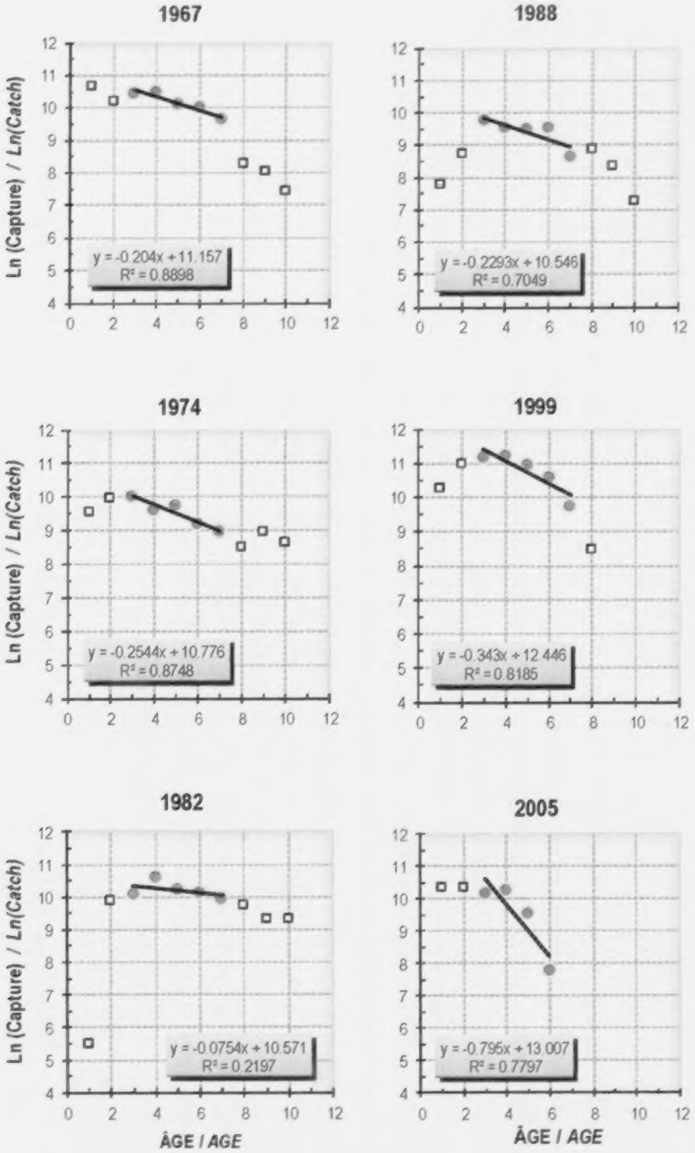


Figure 50. Atlantic mackerel catches (t) of the 1999 year-class (ages 1-9) (A) and cumulative catches (t) at age for the year-classes that have dominated the fishery since the end of the 1960s (B).



Figue 51. Catches at age curves of the year-classes that have dominated the Atlantic mackerel fishery in NAFO Subareas 3-4 since the end of the 1960s.

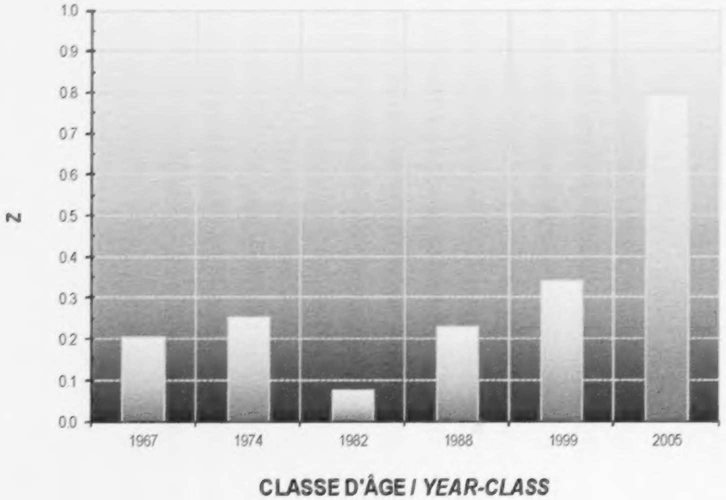


Figure 52. Instantaneous rates of total mortality (Z) calculated according to the catch curves method for the year-classes that have dominated the Atlantic mackerel fishery in NAFO Subareas 3-4 since the end of the 1960s.

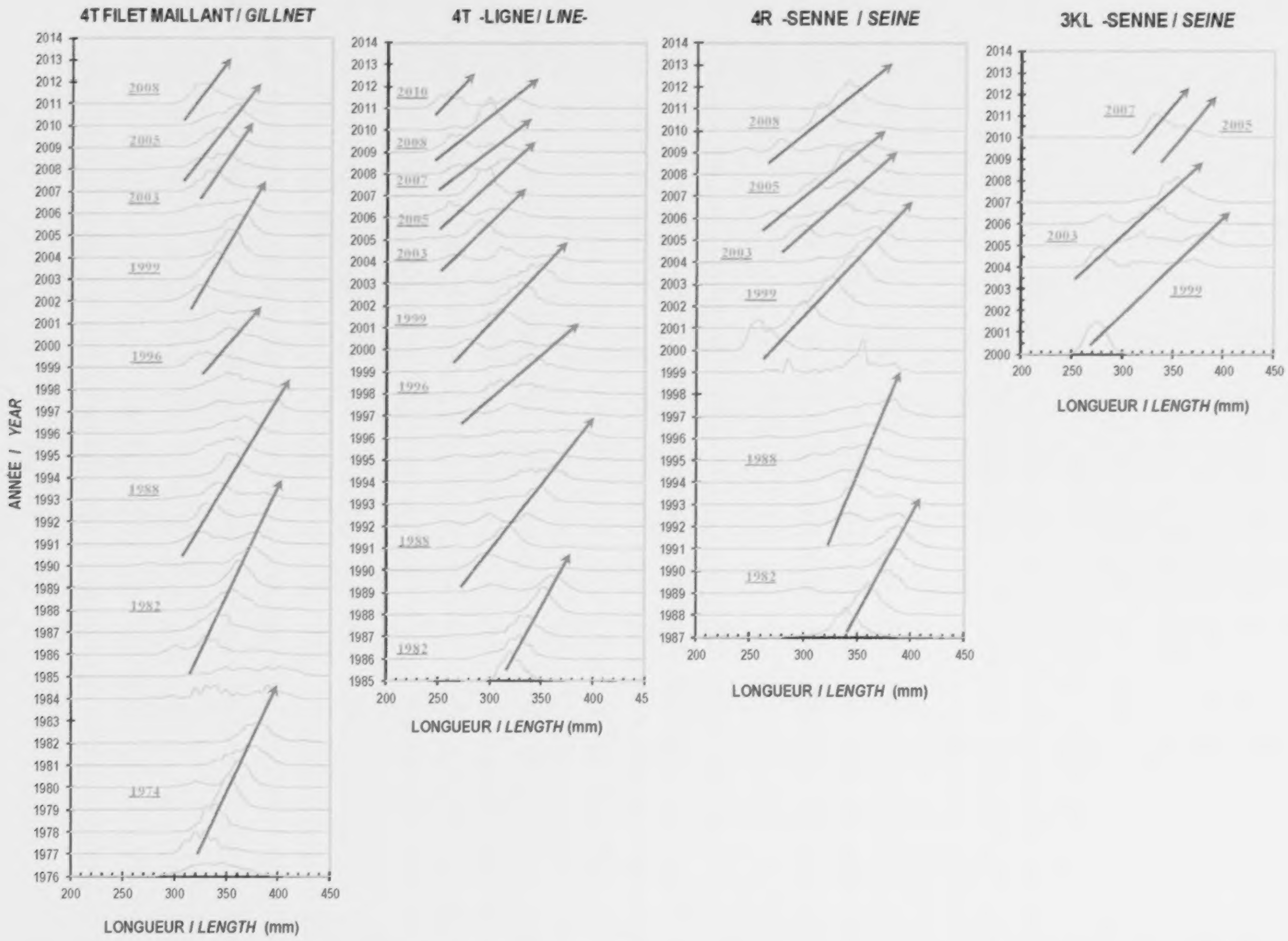


Figure 53. Annual length (mm) frequencies of Atlantic mackerel caught with gillnets and lines in Division 4T and with seine in Divisions 4R and 3KL (the year-classes that have dominated these fisheries are indicated).

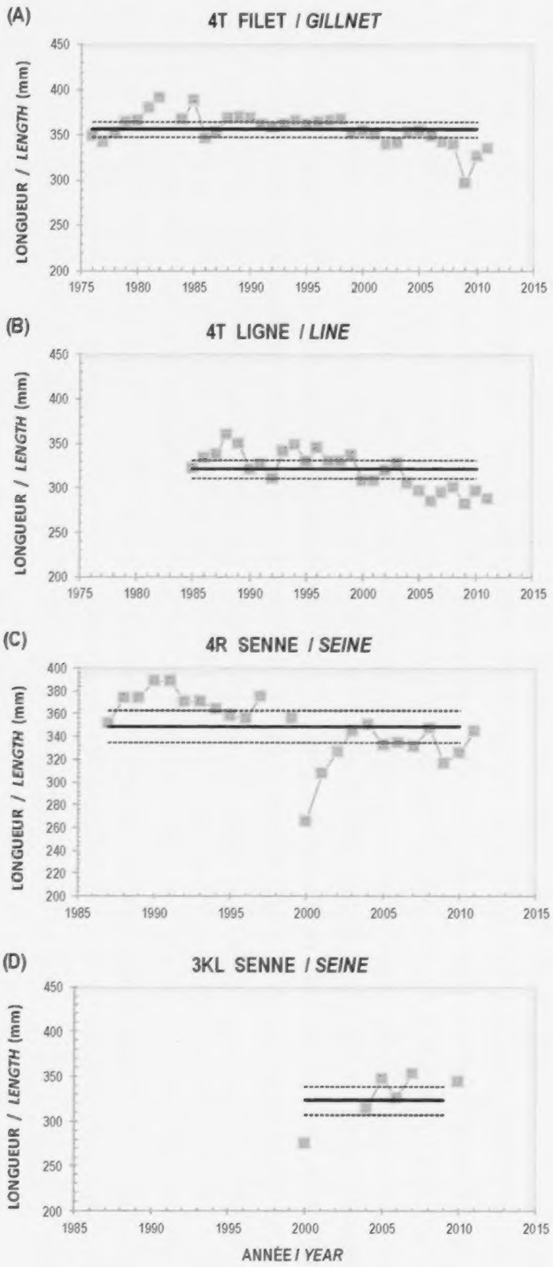


Figure 54. Annual mean length (mm) of Atlantic mackerel caught with gillnets (A) and line (B) in Division 4T and with seine in Divisions 4R (C) and 3KL (D) (horizontal lines represent the averages ± 0.5 standard deviations).

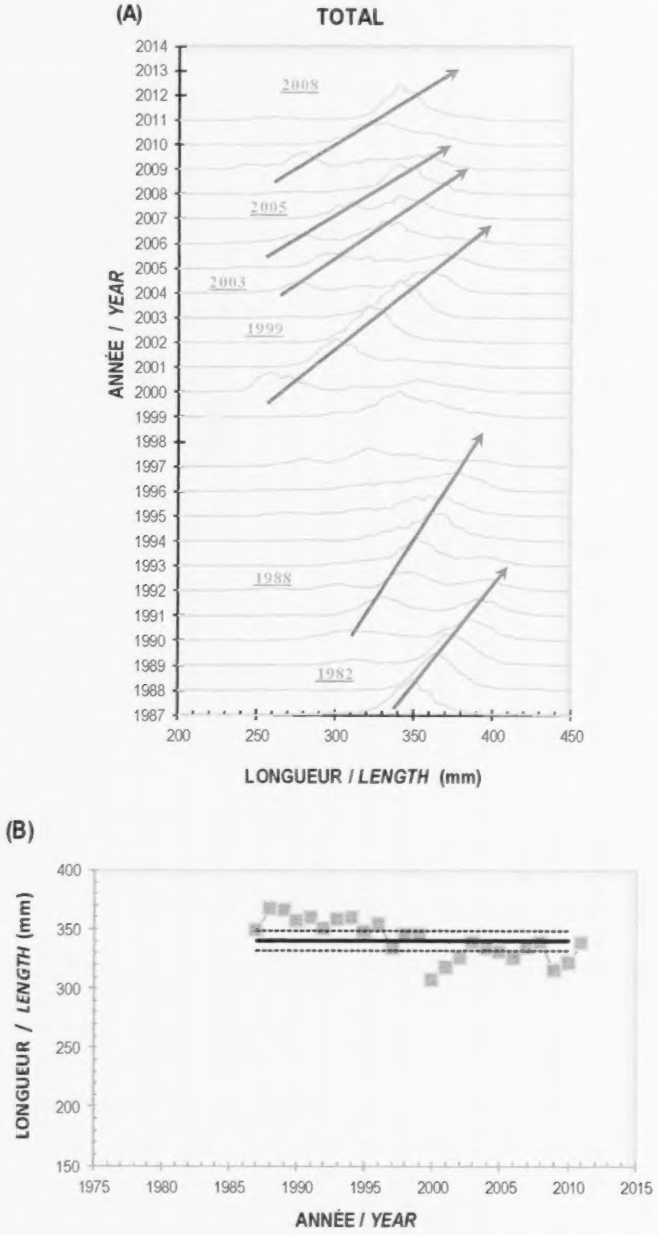


Figure 55. Annual length (mm) frequencies (A) and annual mean length (mm) (B) of the Atlantic mackerel caught in NAFO Divisions 4R, 4T, and 3KL since 1987 (horizontal lines in B represent the average ± 0.5 standard deviation).

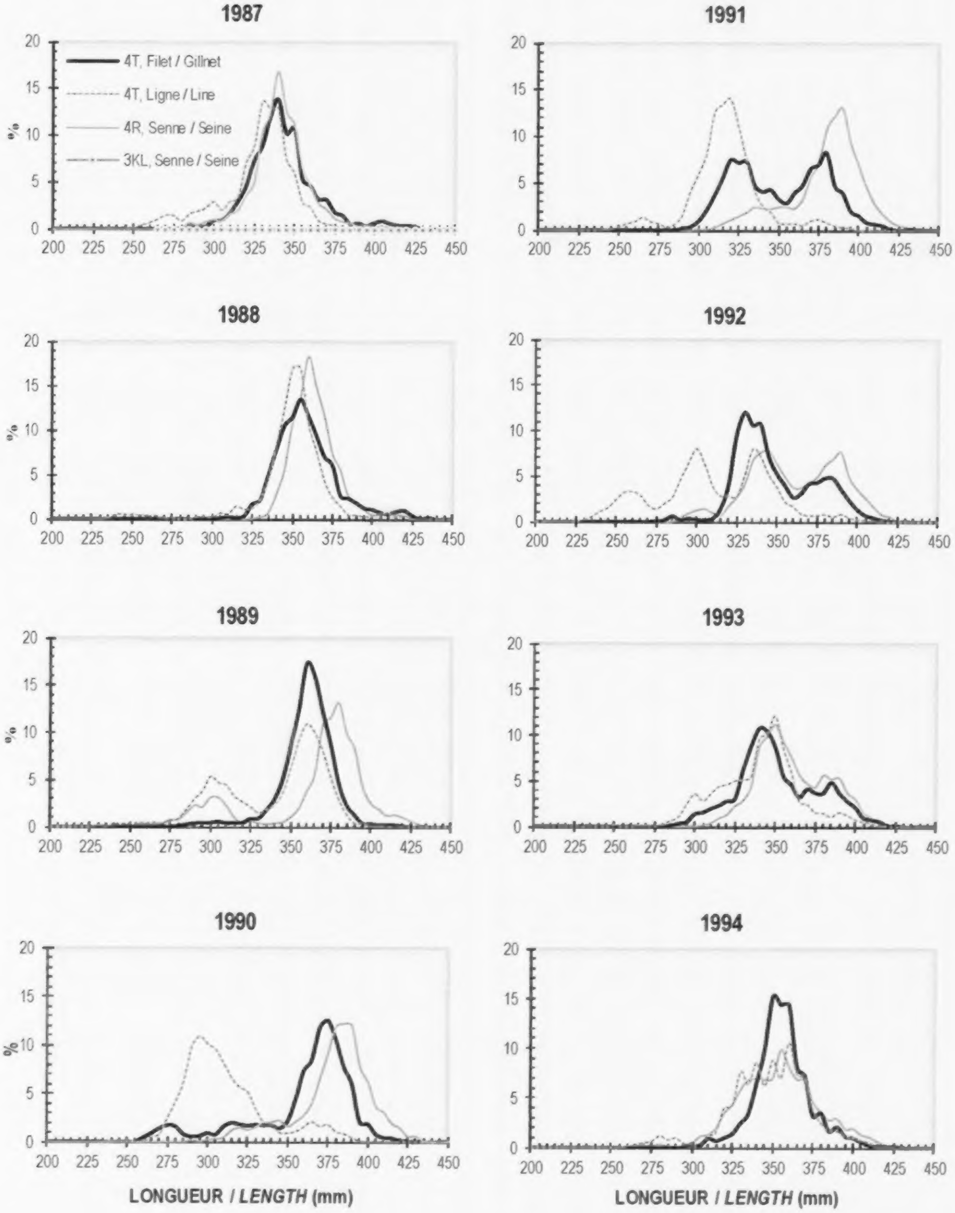


Figure 56. Length (mm) frequencies (%) of the Atlantic mackerel catches made with gillnet, line, and seine in NAFO Divisions 4R, 4T, and 3KL since 1987.

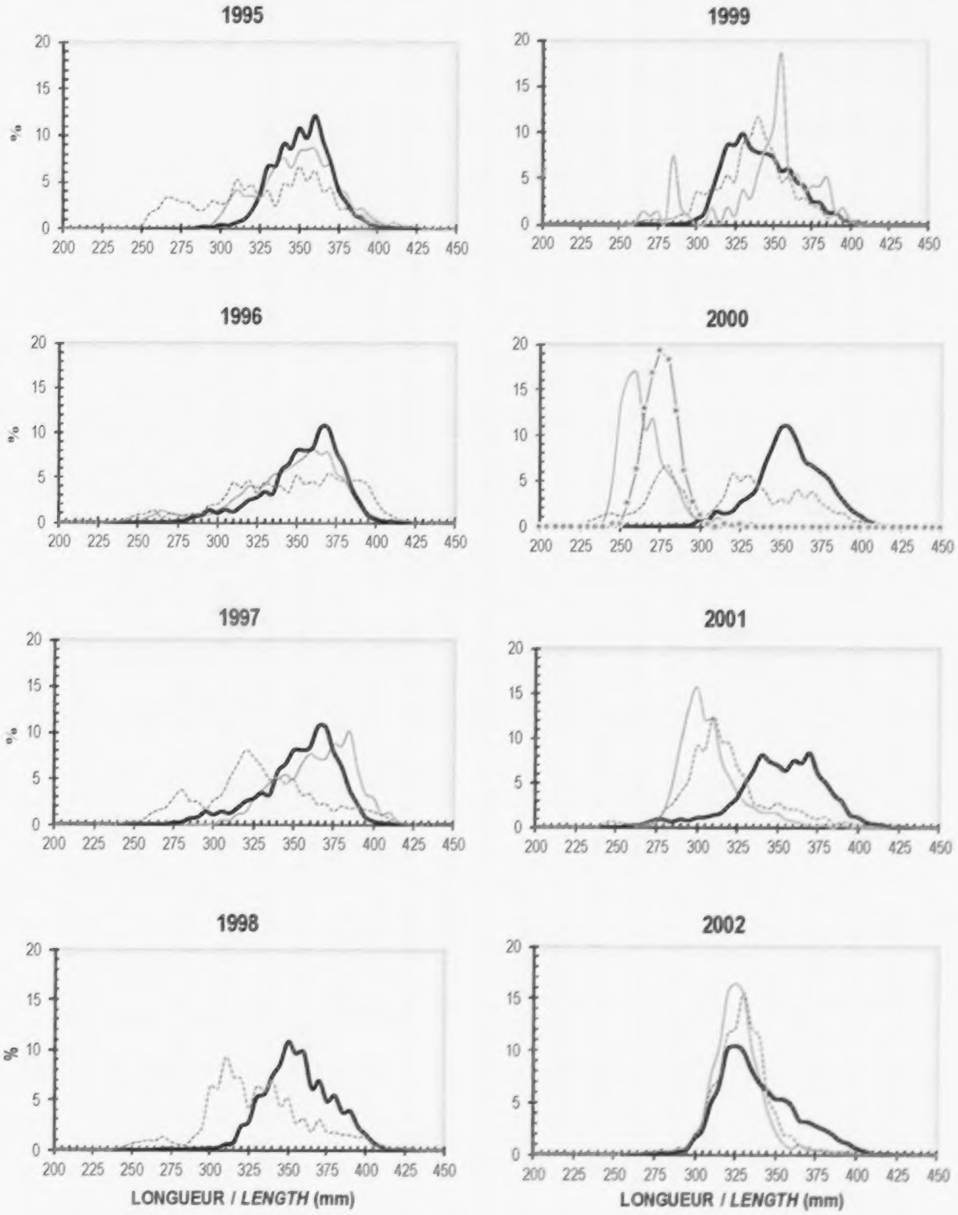


Figure 56. (Continued).

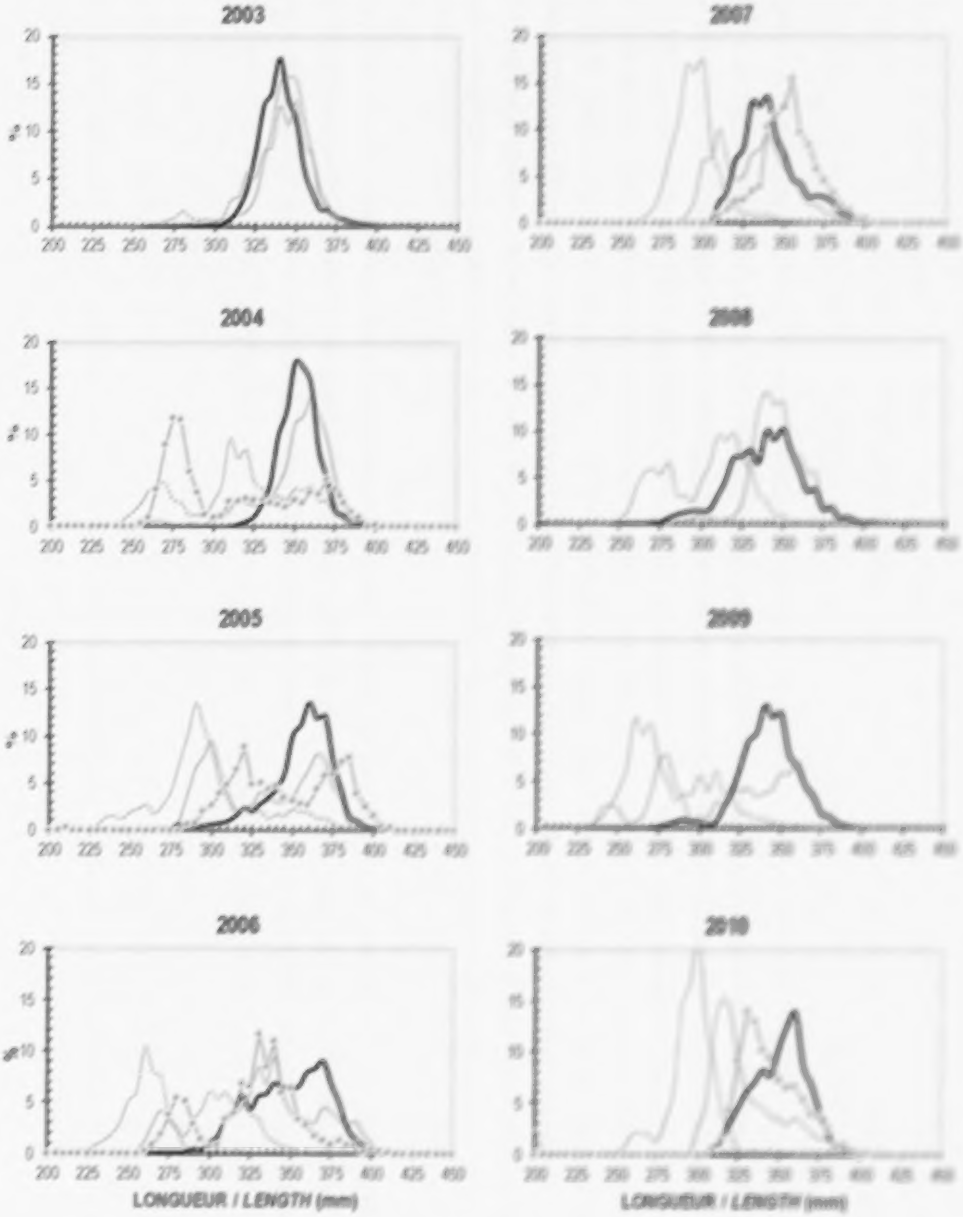


Figure 56. (Continued).

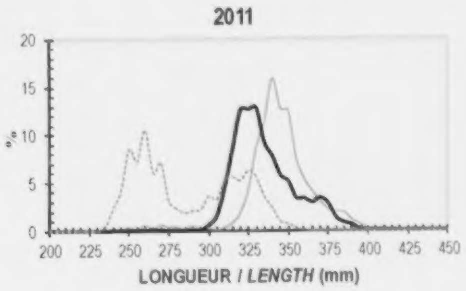


Figure 56. (Continued).

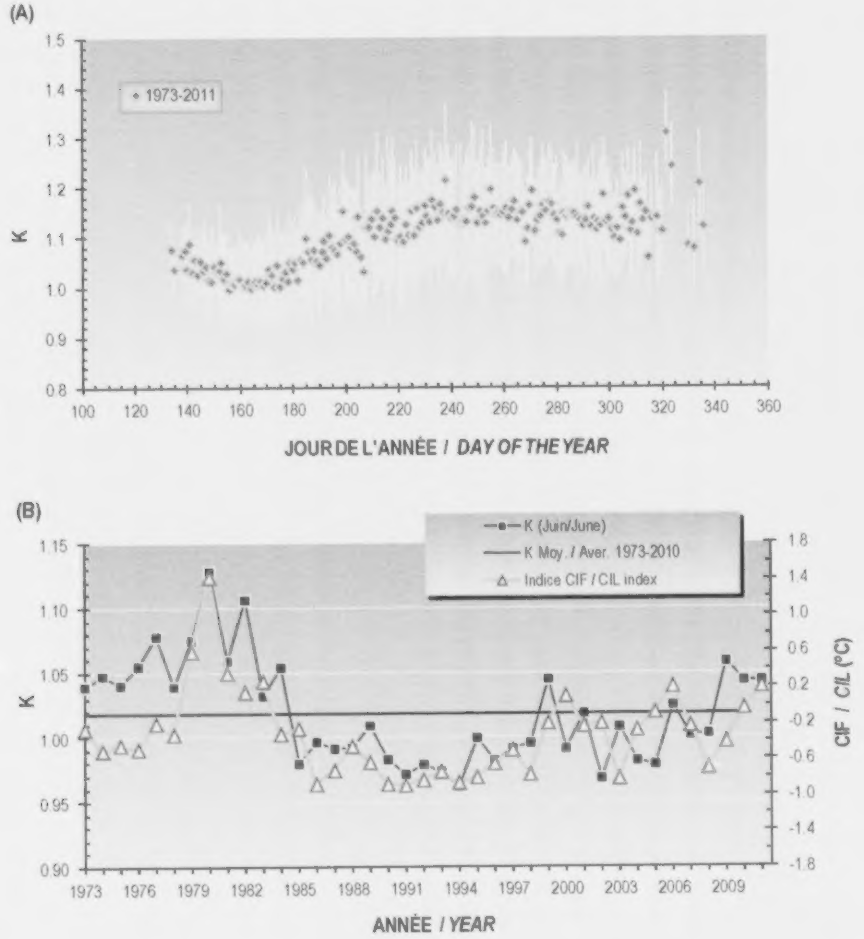


Figure 57. Mean daily values of the Fulton condition factor (K) (with standard deviations) for the 1973-2011 period (A) and annual condition factor calculated in June with the cold intermediate, or CIL, temperature index (B).

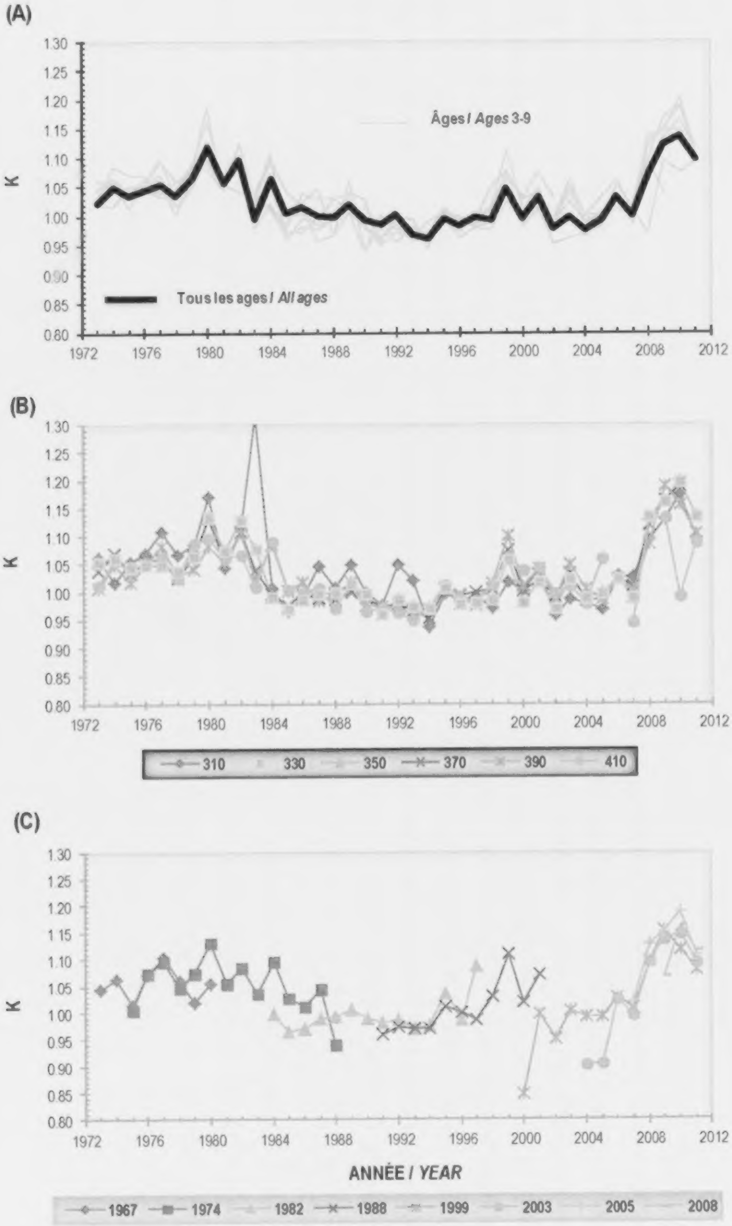


Figure 58. Mean Fulton condition factor (K) calculated in June by age group (A), length class (mm) (B), and year-class (C).

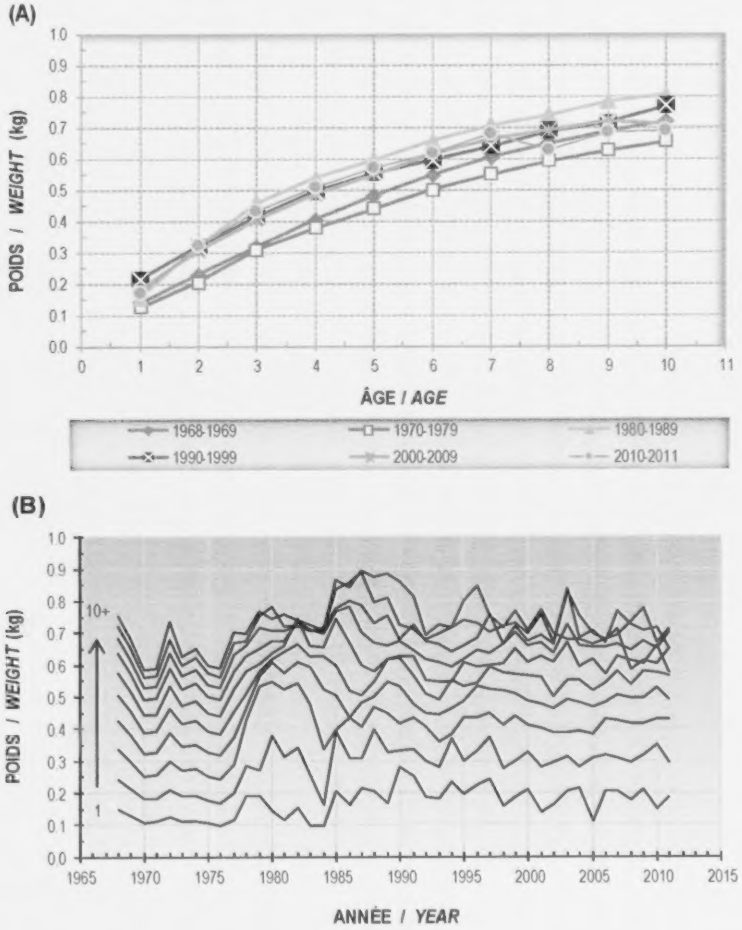


Figure 59. *Mean weight (kg) at age by period of years (A) and annual weight (kg) at ages 1-10$^+$ (B) of the Atlantic mackerel in NAFO Subareas 3-4 since 1968.*

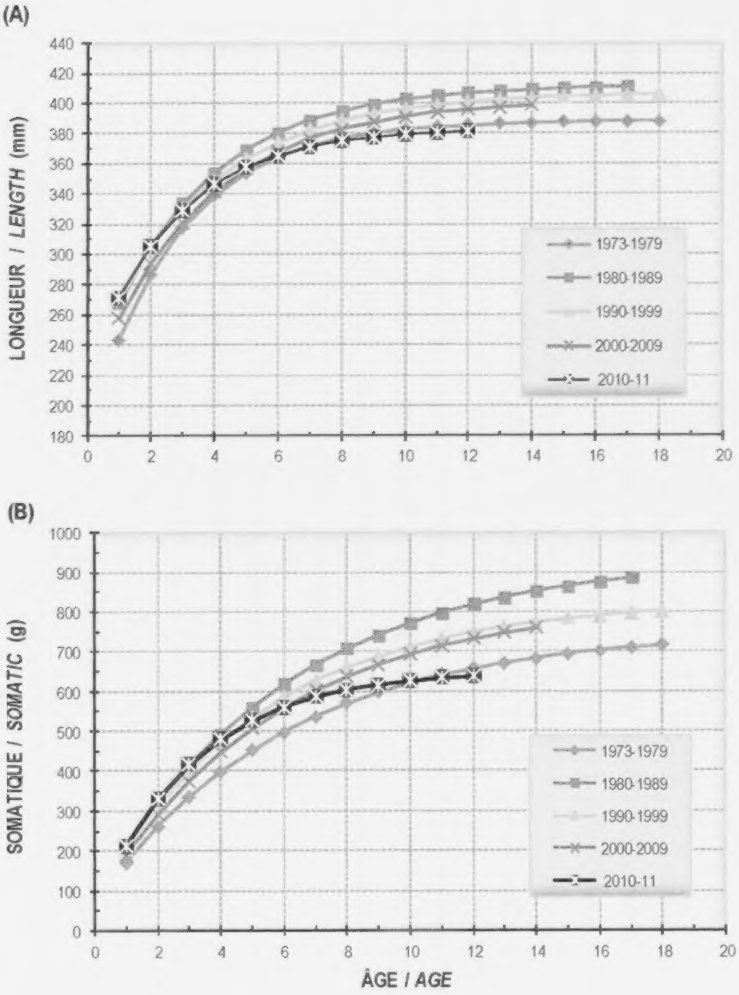


Figure 60. *Von Bertalanffy growth curves for length (mm) (A) and somatic weight (g) (B) calculated by period of years for the Atlantic mackerel in NAFO Subareas 3-4 since 1973.*

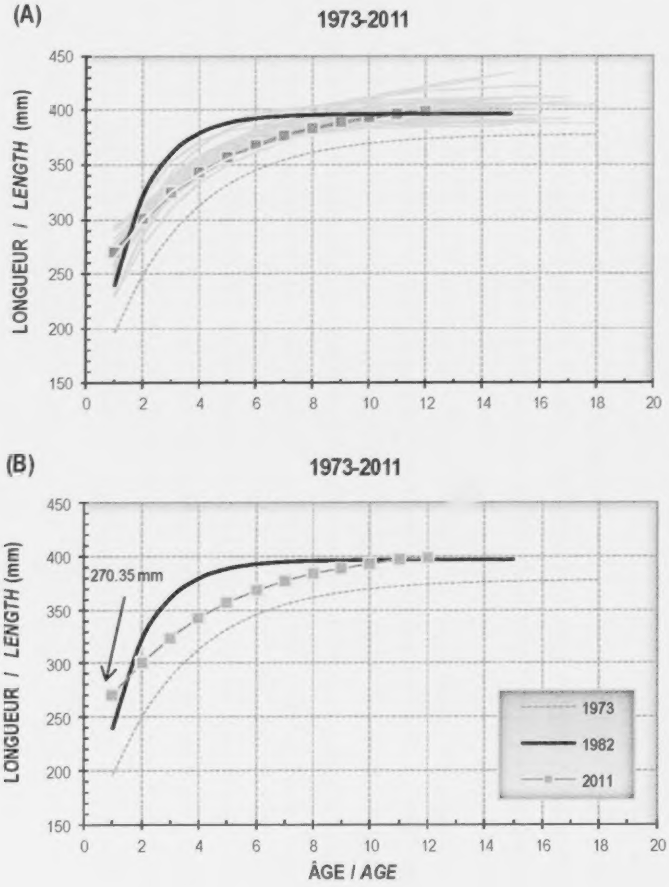


Figure 61. Von Bertalanffy growth curves for length (mm) (A et B) and somatic weight (g) (C and D) of the Atlantic mackerel in NAFO Subareas 3-4 since 1973. The fastest and slowest growth years are indicated.

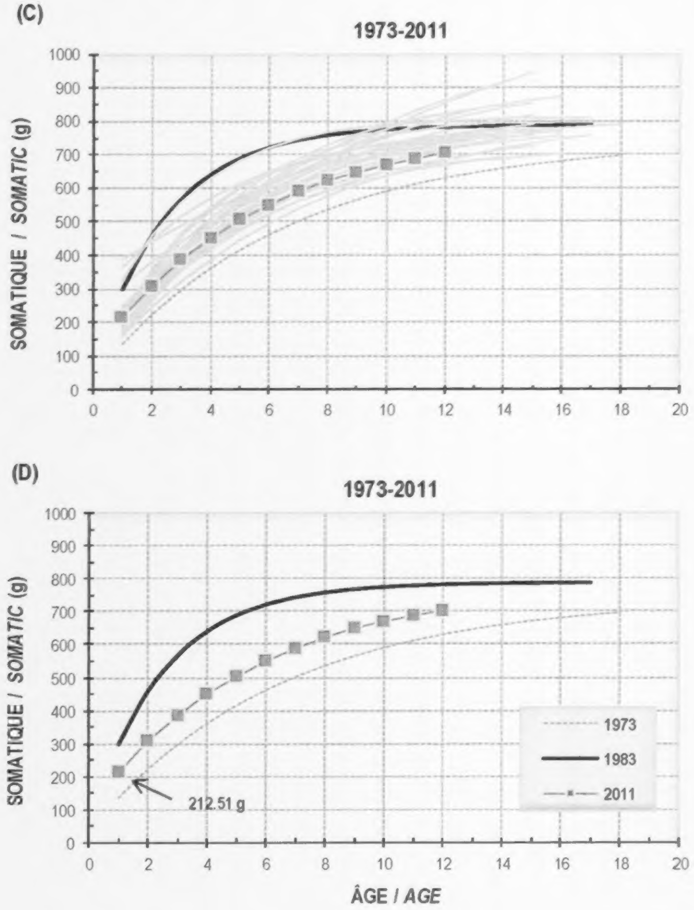


Figure 61. (Continued).

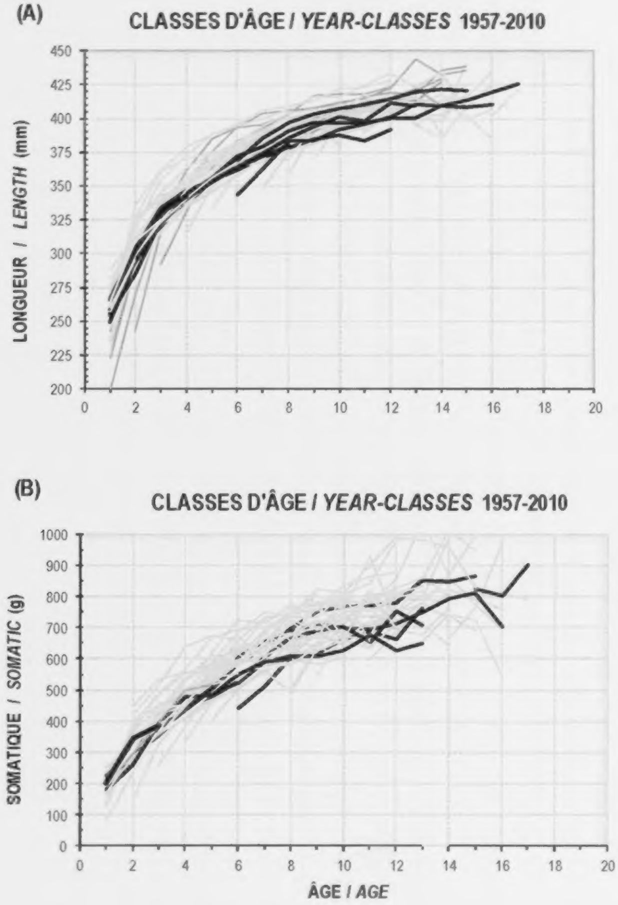


Figure 62. Mean length (mm) (A) and somatic weight (g) (B) at age of the Atlantic mackerel year-classes that were sampled in NAFO Subareas 3-4 since 1973 (the year-classes that have dominated the fishery are indicated by the bold lines).

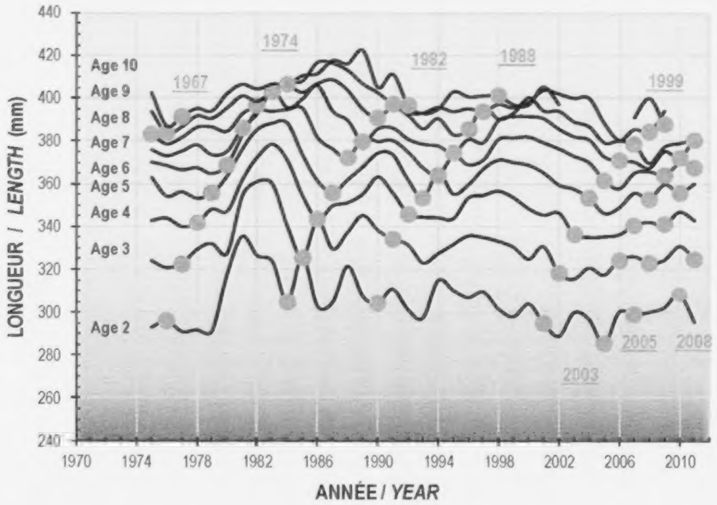


Figure 63. Mean length (mm) calculated by age group for the Atlantic mackerel sampled in NAFO Subareas 3-4 since 1973 (the ages are indicated as are the year-classes that have dominated the fishery).

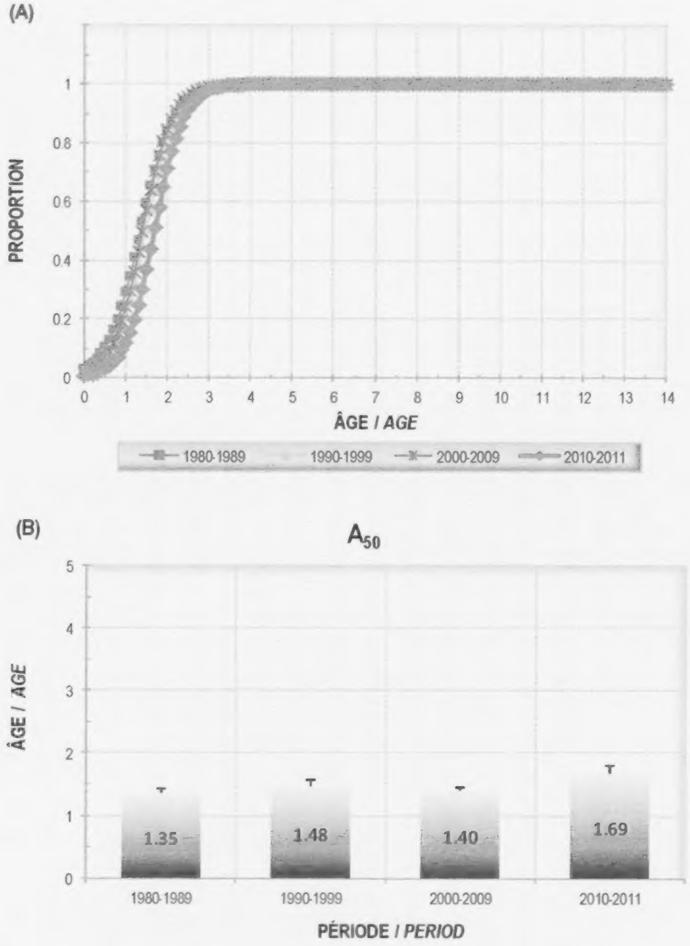


Figure 64. *Proportion of maturity at age by period of years (A) and median age A_{50} (B) (with confidence intervals at 95%) of the Atlantic mackerel sampled in June in NAFO Subareas 3-4 since 1980.*

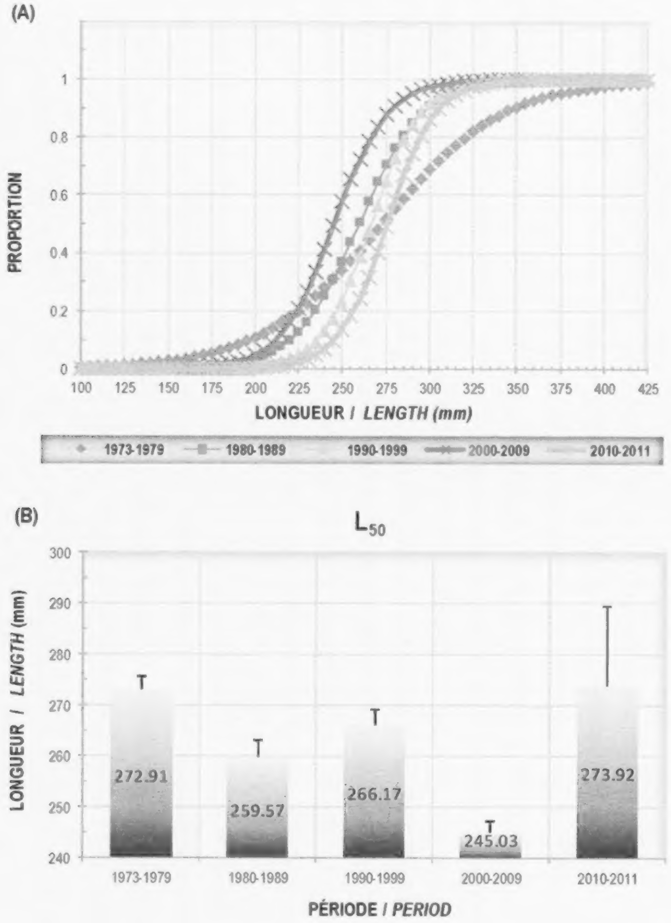


Figure 65. *Proportion of maturity at length by period of years (A) and median length L_{50} (B) (with confidence intervals at 95%) of the Atlantic mackerel sampled in June in NAFO Subareas 3-4 since 1973.*

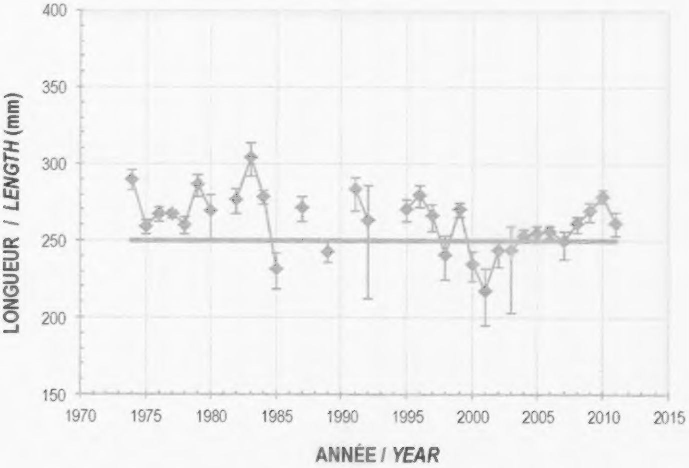


Figure 66. Median length L_{50} of the Atlantic mackerel in NAFO Subareas 3-4 since 1973 (the horizontal line represents the minimum legal size of 250 mm is indicated).

APPENDIX 1.
Species Codes Used by the Nova Scotia Observers.

CODE	NOM	NAME	SCIENTIFIQUE / *SCIENTIFIC*
10	Morue	Cod	*Gadus morhua*
11	Aiglefin	Haddock	*Melanogrammus aeglefinus*
12	Merluche blanche	White hake	*Urophycis tenuis*
13	Merluche-écureuil	Red hake	*Urophycis chuss*
14	Merlu argenté	Silver hake	*Merluccius bilinearis*
16	Goberge	Pollock	*Pollochius virens*
23	Sébaste	Redfish	*Sebastes spp.*
30	Flétan atlantique	Atlantic halibut	*Hippoglossus hippoglossus*
42	Limande à queue jaune	Yellowtail flounder	*Limanda ferruginea*
43	Plie rouge	Winter flounder	*Pseudopleuronectes americanus*
49	Poisson plat	Flatfish	Pleuronectidae
60	Hareng	Herring	*Clupea harengus*
70	Maquereau bleu	Atlantic mackerel	*Scomber scombrus*
71	Thon rouge	Bluefin tuna	*Thunnus thynnus*
211	Raies	Skates	Rajidae
220	Aiguillat commun	Spiny dogfish	*Aqualus acanthias*
400	Baudroie	Monkfish	*Lophius americanus*
2211	Crevette nordique	Shrimp	*Pandalus borealis*
2550	Homard	American lobster	*Homarus americanus*
4511	Calmar courtes nageoires	Short-fin squid	*Illex illecebrosus*
7001	Morue, goberge, aiglefin	Cod, pollock, haddock	
7099	Autres	Other	
6600	Concombres de mer	Sea cucumbers	Holothuroidea
7011	Échantillonnage écosystème	Ecosystem sampling	
NK	Inconnu	Not known	